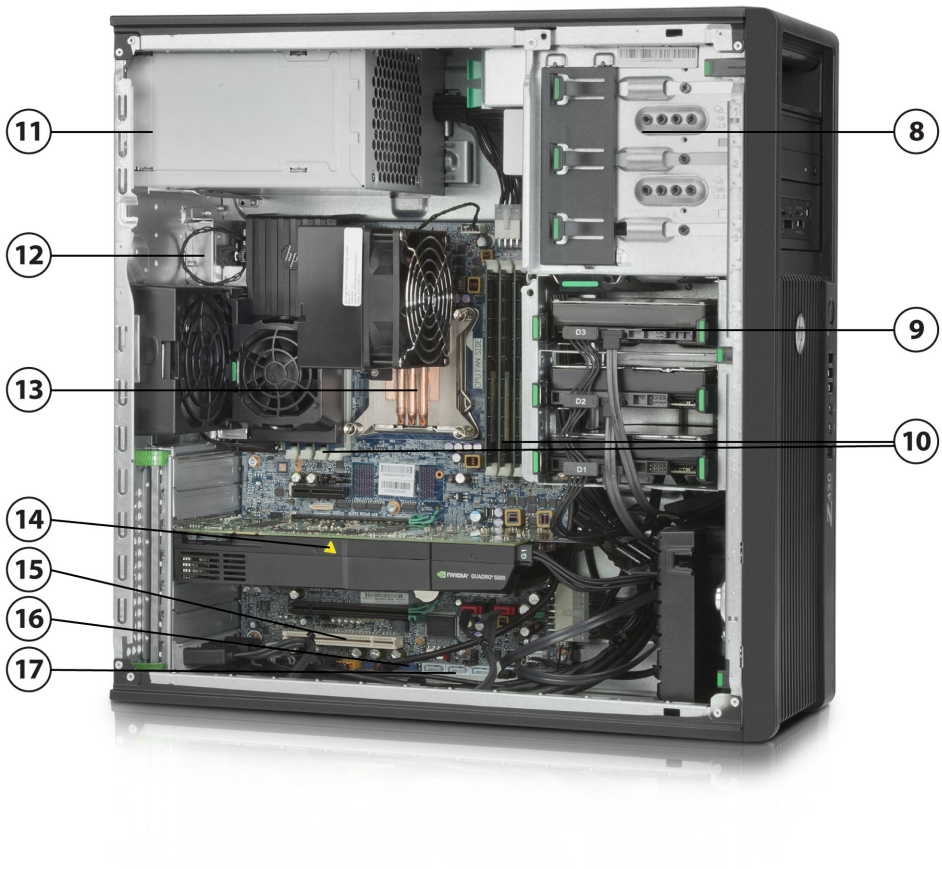
Overview

1. Handle in Top Optical Bay (optional)
2. 3 External 5.25” Bays
3. 22-in-1 Media Card Reader (optional)
4. Power Button
5. HDD Activity LED
6. Front I/O: 1 USB 2.0, 2 USB 3.0, 1 Headphone, 1 Microphone, 1 1394a
7. Easy-open Side Panel

Overview



8. 3 External 5.25” Bays
9. 3 Internal 3.5” Bays
10. 8 DIMM Slots for DDR3 ECC Memory
11. 600W, 90% Efficient Power Supply
12. Rear I/O: Rear Power Button & LED, PS/2 Ports, 1 1394a, 4 USB 2.0, 2 USB 3.0, 1 RJ-45 to Integrated GbE, 1 Audio Line In, 1 Audio Line Out, 1 Microphone
13. Intel Xeon Processors: E5-1600 family (4C/6C), E5-2600 family (8C), E5-1600v2 family (4C/6C/8C), E5-2600v2 (8C)
14. 2 PCIe x16 Gen3 Slots
15. 1 PCIe x8 Gen3, 1 PCIe x8(x4) Gen2, 1 PCIe x4(x1) Gen2, 1 PCI Slot
16. 6 Internal USB 2.0 Ports
17. 6 SATA Ports

Overview

Form Factor	Convertible Minitower
Operating Systems	Preinstalled: • Windows 7 Ultimate 64-Bit • Windows 7 Professional 32-Bit • Windows 7 Professional 64-Bit • Windows 8 Pro 64-bit • Windows 8 Simplified Chinese Edition 64-bit • Windows 8 Pro Downgrade to Windows 7 Professional 32-bit • Windows 8 Pro Downgrade to Windows 7 Professional 64-bit • Windows 8.1 Pro 64-bit • Windows 8.1 Simplified Chinese Edition 64-bit • Windows 8.1 Pro Downgrade to Windows 7 Professional 32-bit • Windows 8.1 Pro Downgrade to Windows 7 Professional 64-bit • SUSE Linux Enterprise Desktop 11 (90 day support) • HP Installer Kit for Linux (includes drivers for 64-bit OS versions of RHEL 5 & 6 and SUSE Linux Enterprise Desktop 11) • Red Hat Enterprise Linux Desktop (Paper license with 1 year support; no preinstalled OS) Supported: • Genuine Windows® 7 Enterprise 32/64 • Windows® XP Professional 32/64 (on select configurations)* Notes: *See the "Windows XP Support Matrix for Z Workstations" at: http://www.hp.com/support/workstation_manuals Notes: For detailed OS/hardware support information for Linux, see: http://www.hp.com/support/linux_hardware_matrix

Available Processors

Name	Cores	Clock Speed (GHz)	Cache (MB)	Memory Speed (MHz)	QPI Speed (GT/s)	Hyper-Threading	Featuring Intel® vPro™ Technology	Intel® Turbo Boost Technology[1]	TDP (W)
Intel® Xeon® E5-1680 v2 processor	8	3.0	25	1866	-	Y	Y	4, 9	130
Intel Xeon E5-2650 v2 processor	8	2.6	20	1866	8.0	Y	Y	4, 8	95
Intel Xeon E5-1660 v2 processor	6	3.7	15	1866	-	Y	Y	2, 3	130
Intel Xeon E5-1650 v2 processor	6	3.5	12	12	-	Y	Y	1, 4	130
Intel Xeon E5-1620 v2 processor	4	3.7	10	1866	-	Y	Y	0, 2	130

Overview

	Intel Xeon E5-1607 v2 processor	4	3.0	10	1600	-	N	Y	N/A	130
	Intel Xeon E5-1620 processor	4	3.6	10	1600	-	Y	Y	2, 3	130
	Intel Xeon E5-1603 processor	4	2.8	10	1066	-	N	Y	N/A	130
	[1]The specifications shown in this column represent the following: (all core maximum turbo steps, one core maximum turbo steps). Turbo boost stepping occurs in 100MHz increments. Processors that do not have turbo functionality are denoted as N/A. **NOTE:** Although the Intel Xeon E5-2600 processor family supports dual processors, the HP Z420 Workstation does not support dual processor configurations.									
Available Processor Disclaimers	Intel's numbering is not a measurement of higher performance. Processor numbers differentiate features within each processor family, not across different processor families. See: http://www.intel.com/products/processor_number/ for details. 64-bit computing on Intel® 64 architecture requires a computer system with a processor, chipset, BIOS, operating system, device drivers and applications enabled for Intel 64 architecture. Processor will not operate (including 32-bit operation) without an Intel 64 architecture-enabled BIOS. Performance will vary depending on your hardware and software configurations. See: http://www.intel.com/info/em64t for more information. Quad-Core, Six-Core, and Eight-Core technologies are designed to improve performance of multithreaded software products and hardware-aware multitasking operating systems and may require appropriate operating system software for full benefits. Check with software provider to determine suitability. Not all customers or software applications will necessarily benefit from use of these technologies.									
Color	Jack Black									
Convertibility	Yes. 5.25" drives rotate for Minitower or Desktop orientation.									
Expansion Slots (see system board section for more details)	Slot 1 (top): PCI Express Gen2 x4(1)* Full-height, Full-length Slot 2: PCI Express Gen3 x 16 Full-height, Full-length (with extender) Slot 3: PCI Express Gen2 x 8(4)* with open-ended connector** Full-height, Full-length (with extender) Slot 4: PCI Express Gen3 x8 with open-ended connector** Full-height, Full-length (with extender) Slot 5: PCI Express Gen3 x16 Full-height, Full-length (with extender) Slot 6: PCI 32bit/33MHz Full-height, Full-length (with extender)									

Overview

	* x<number> = number of lanes or size of the physical/mechanical connector. (number) = number of lanes supported electrically. Typically communicated as x# mechanical, x(#)electrical. ** open-ended connector allows a greater bandwidth (e.g. x16) card to be installed physically into a lower bandwidth connector/slot.	
Expansion Bays (see storage section for more details)	3 internal 3.5" bays (with acoustic dampening rail assemblies pre-installed) 3 external 5.25" bays (4th HDD occupies one external bay) Top and Middle 5.25" bay device depth limit: 206mm (8.11 inches) Bottom 5.25" bay device depth limit: 173mm (6.81 inches)	
Front I/O	2 USB 3.0, 1 USB 2.0, 1 IEEE 1394a standard, 1 Headphone,1 Microphone	
Internal I/O	6 USB 2.0 ports available by three separate 2x5 headers. Each 2x5 header supports either one HP Internal USB Port Kit (EM165AA) or one 22-in-1 Media Card Reader.	
Rear I/O	2 USB 3.0, 4 USB 2.0,1 IEEE 1394a port, 2 PS/2, RJ-45 (NIC), 1 Audio Line-In, 1 Audio Line-Out, 1 Microphone. Serial supported with optional connector on PCI bracket cabled to system board connector	
Interfaces Supported	14-in-1 Media Card Reader (optional) 6-channel SATA interface (2 @ 6.0 Gb/s, 4 @ 3.0 Gb/s). 6 channels are eSATA configurable for use with eSATA CTO/AMO Kit. USB 2.0, USB 3.0, IEEE 1394a interface	
Chassis Dimensions (HxWxD)	Standard minitower orientation: 44.76 x 17.78 x 44.52 cm (17.6 x 7.0 x 17.5 in) Converted desktop orientation: 17.9 x 44.76 x 44.52 cm (7.0 x 17.6 x 17.5 in)	
Weight	Exact weights depend upon configuration. Minimum: 12.5kg (27.5 lbs) Standard: 13.2kg (29.2 lbs) Maximum: 17.7kg (39 lbs)	
Temperature	Operating:	5° to 35°C (40° to 95°F)
	Non-operating	-40° to 60°C (-40° to 140°F)
Humidity	Operating:	8% to 85% relative humidity, non-condensing
	Non-operating	8% to 90% relative humidity, non-condensing
Maximum Altitude (non-pressurized)	Operating:	3,048m (10,000ft)
	Non-operating	9,144m (30,000ft)
Power Supply	600 watts wide-ranging, active Power Factor Correction, 90% Efficient The Z420 600W power supply efficiency report can be found at this link: http://www.plugloadsolutions.com/psu_reports/HEWLETT PACKARD_623193-001_ECOS 2619 1_600W_Report.pdf	
Workstation ISV Certifications	See the latest list of certifications at http://www.hp.com/united-states/campaigns/workstations/partnerships.html	

Supported Components

Processors

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
Intel Xeon E5-1600 Series				
Intel® Xeon® Processor E5-1620 4C 3.60GHz	Y	N		
Intel® Xeon® Processor E5-1603 4C 2.80GHz	Y	N		
Intel Xeon E5-2600 v2 Series - CTO				
Intel® Xeon® Processor E5-2650 v2 8C 2.60GHz	Y	N		
Intel Xeon E5-1600 v2 Series				
Intel® Xeon® Processor E5-1680 v2 8C 3.00GHz	Y	N		
Intel® Xeon® Processor E5-1660 v2 6C 3.70GHz	Y	N		
Intel® Xeon® Processor E5-1650 v2 6C 3.50GHz	Y	N		
Intel® Xeon® Processor E5-1620 v2 4C 3.70GHz	Y	N		
Intel® Xeon® Processor E5-1607 v2 4C 3.00GHz	Y	N		

HP Liquid Cooling option available for all the above processors.
Intel's numbering is not a measurement of higher performance.

Monitors / Displays

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP DreamColor LP2480zx Professional Display				
HP ZR30w 30-inch S-IPS LCD Monitor				
HP ZR2740w 27-inch LED Backlit IPS Monitor				
HP ZR2440w 24-inch LED Backlit IPS Monitor				
HP ZR2240w 21.5-inch LED Backlit IPS Monitor				
HP ZR2040w 20-inch LED Backlit IPS Monitor				

Supported by all operating systems available from HP
Screen size measured diagonally

Hard Drives

Sub-Section Description/Notes

Up to (4) 3.5-inch 15K rpm SAS drives: 300, 450, 600 GB; 2.4 TB max

Up to (4) 2.5-inch 10K rpm SAS drives: 300, 600, 900 GB, 1.2 TB; 4.8 TB max

NOTE: SAS controller add-in card required

NOTE: 4th SFF HDDs will be automatically installed into the top optical bay in a Handle/HDD carrier

Removable Boot Drive option

SAS Hard Drives **Option**

Supported Components

		Factory Configured	Option Kit	Kit Part Number	Support Notes
	HP SAS (Serial Attached SCSI) Hard Drives for HP Workstations				
	600GB SAS 15K rpm 6Gb/s 3.5" HDD	Y	Y	VM647AA	
	450GB SAS 15K rpm 6Gb/s 3.5" HDD	Y	Y	LU968AA	
	300GB SAS 15K rpm 6Gb/s 3.5" HDD	Y	Y	LU967AA	
	HP 1.2TB SAS 10K SFF HDD	Y	Y	E2P04AA	
	HP 900GB SAS 10K SFF HDD	Y	Y	E2P03AA	
	HP 600GB SAS 10K SFF HDD	Y	Y	A2Z21AA	
	HP 300GB SAS 10K SFF HDD	Y	Y	A2Z20AA	
	Sub-Section Description/Notes				
	Up to (4) 3.5-inch 7200 rpm SATA drives: 250, 500 GB, 1.0, 2.0, 3.0 TB; 12.0 TB max				
	Up to (4) 2.5-inch 10K rpm SATA drives: 250, 500 GB, 1.0 TB; 4.0 TB max				
	Up to (1) 2.5-inch SATA Self-Encrypting Drive (SED): 500 GB				
	Removable Boot Drive option				
SATA Hard Drives	**SATA (Serial ATA) Hard Drives for HP Workstations**				
	500GB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	LQ036AA	
	1TB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	LQ037AA	
	2.0TB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	QB576AA	
	3.0TB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	QF298AA	
	250GB SATA 10K rpm SFF HDD	Y	Y	B8X18AA	
	500GB SATA 10K rpm SFF HDD	Y	Y	B8X19AA	
	1TB SATA 10K rpm SFF HDD	Y	Y	B8X20AA	
	500GB SATA 7.2K SED SFF HDD	Y	N		
	Sub-Section Description/Notes				
	Up to (4) 2.5-inch Micron 6Gb/s SATA Solid State Drives: 128, 256, 512 GB; 3.0 TB max				
	Up to (1) 2.5-inch SATA Self-Encrypting Solid State Drive (SED SSD): Micron 6Gb/s 256 GB				
	Up to (4) 2.5-inch Seagate 600 Pro 6Gb/s SATA Solid State Drives: 120, 240, 480 GB; 1.9 TB max				
	Up to (1) 2.5-inch Intel Pro 1500 6Gb/s SATA Solid State Drive: 180 GB				
	NOTE: 4th SSDs will be automatically installed into the top optical bay in a Handle/HDD carrier				
SATA Solid State Drives	**HP Solid State Drives (SSDs) for Workstations**				
	HP 128GB SATA 6Gb/s SSD	Y	Y	A3D25AA	
	HP 256GB SATA 6Gb/s SSD	Y	Y	A3D26AA	
	HP 512GB SATA 6Gb/s SSD	Y	Y	D8F30AA	
	HP 256GB SATA 6Gb/s SED SSD	Y	N		
	Seagate 600 Pro 120GB SATA SSD	Y	Y	E9Q50AA	

Supported Components

	Seagate 600 Pro 240GB SATA SSD	Y	Y	E9Q51AA
	Seagate 600 Pro 480GB SATA SSD	Y	Y	E9Q52AA
	Intel Pro 1500 180GB SATA SSD	Y	Y	F5Z70AA
PCIe SSDs	**PCIe SSDs for HP Workstations**			
	Fusion ioFX 410GB PCIe Accelerator	Y	Y	E4W49AA

For hard drives, 1 GB = 1 billion bytes; TB = 1 trillion bytes. Actual formatted capacity is less.

Hard Drive Controllers

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
Integrated SATA 6.0 Gb/s Controller				
Integrated SATA 6.0 Gb/s Controller	Y	N		Two ports
Integrated SATA 3.0 Gb/s Controller				
Integrated SATA 3.0 Gb/s Controller	Y	N		Four ports
Factory integrated RAID on motherboard for SATA drives				
RAID 0 Configuration - Striped Array	Y	N		Note 1
RAID 0 Data Configuration -- Boot/OS Drive + 2 Drive Striped Array	Y	N		Note 1
RAID 1 Configuration - Mirrored Array	Y	N		Note 1
RAID 10 Configuration - Striped/Mirrored Array	Y	N		Note 1
RAID 5 Configuration - Parity Array	Y	N		Note 1
LSI 9217-4i4e 8-port SAS 6Gb/s RAID Card				
LSI 9217-4i4e 8-port SAS 6Gb/s RAID Card	Y	Y	E0X20AA	Note 2
LSI MegaRAID® 9260-8i SAS 6Gb/s ROC RAID Card and iBBU08 Battery Backup Unit				
LSI MegaRAID® 9260-8i SAS 6Gb/s ROC RAID Card	N	Y	WE465AA	Note 2
Optional: LSI iBBU08 Battery Backup Unit for LSI 9260-8i	N	Y	LA783AA	
LSI 9270-8i SAS 6Gb/s ROC RAID Card and iBBU9 Battery Backup Unit				
LSI 9270-8i SAS 6Gb/s ROC RAID Card	Y	Y	E0X21AA	Note 2
LSI iBBU09 Battery Backup Unit	N	Y	E0X19AA	

SATA hardware RAID is supported on Linux systems that have support for the Intel RSTe technology. The Linux kernel, with built-in software RAID, provides excellent functionality and performance. It is a good alternative to hardware-based RAID. Please visit http://www.hp.com/support/linux_hardware_matrix for RAID capabilities with Linux.

All drives must be identical in type and capacity.
RAID arrays greater than 2 TB are fully supported.
NOTE 1: Requires hard drives with identical speed, capacity, and interface. Specific user-configured hardware SAS RAID configurations are supported on this Linux system. For details, please visit http://www.hp.com/support/linux_hardware_matrix
NOTE 2: Specific user-configured hardware SAS RAID configurations are supported on this Linux system. IS: Striping of 2 or more HDDs into a single logical volume
IM: Mirroring of 2 HDDs into a single logical volume

Supported Components

IME: Mirroring of 3 or more HDDs into a single logical volume.
For details, please visit http://www.hp.com/support/linux_hardware_matrix

Graphics

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes	Supported # of cards	Supported Mixed?
Professional 2D						
NVIDIA NVS 310 512MB Graphics	Y	Y	A7U59AA	Note 1	3	YES
NVIDIA NVS 315 1GB Graphics	Y	Y	E1U66AA	Note 1	3	NO
NVIDIA NVS 510 2GB Graphics	Y	Y	C2J98AA	Note 2	2	YES
Entry 3D						
NVIDIA Quadro 410 512MB Graphics	Y	Y	A7U60AA		2	NO
NVIDIA Quadro K600 1GB Graphics	Y	Y	C2J92AA		2	NO
AMD FirePro V3900 1GB Graphics	Y	Y	A6R69AA		2	NO
Mid-range 3D						
NVIDIA Quadro K2000 2GB Graphics	Y	Y	C2J93AA		2	NO
High End 3D						
AMD FirePro W7000 4GB Graphics	Y	Y	C2K00AA	Note 3	1	NO
NVIDIA Quadro K4000 3GB Graphics	Y	Y	C2J94AA		1	NO
NVIDIA Quadro K5000 4GB Graphics	Y	Y	C2J95AA	Note 3	1	NO
NVIDIA Quadro 6000 6GB Graphics	N	Y	WS097AA	Note 3	1	NO

NOTE 1: When configuring with a 3rd NVS 300, 310, or 315--the configuration requires the Z4 Fan and Front Card Guide Kit, which is available both CTO (QE150AV) and AMO (A2Z46AA).
NOTE 2: If 1st graphics card is NVS 510 then 2nd graphics card must be NVS 510 or NVS 310.
NOTE 3: Configuration requires the Z4 Fan and Front Card Guide Kit, which is available both CTO (QE150AV) and AMO (A2Z46AA).

High Performance GPU Computing

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
NVIDIA Tesla K20c Compute Processor	Y	Y	C2J97AA	Notes 1, 2

NOTE 1: This device does not have an operational graphics output.

Tesla C2075 configurations require the addition of either NVIDIA Quadro 600 1st graphics or NVIDIA Quadro 2000 1st graphics.

Tesla K20c configurations require the addition of either NVIDIA Quadro K600 1st graphics or NVIDIA Quadro K2000 1st graphics.

NOTE 2: All Tesla configurations require the Z4 Fan and Front Card Guide Kit, which is available both CTO (QE150AV) and AMO (A2Z46AA).

Supported Components

Memory	CTO	Option Kit Part Number	Support Notes
	DDR3-1600 ECC Unbuffered DIMMs - CTO		
	8GB DDR3-1600 ECC Unbuffered RAM		
	4GB DDR3-1600 ECC Unbuffered RAM		
	2GB DDR3-1600 ECC Unbuffered RAM		
	DDR3-1866 ECC Unbuffered DIMMs - CTO		
	8GB DDR3-1866 ECC Unbuffered RAM		
	4GB DDR3-1866 ECC Unbuffered RAM		
	2GB DDR3-1866 ECC Unbuffered RAM		
	Sub-Section Description/Notes		
	For details on the supported memory configurations on the HP Z420 Workstation, please refer to the System Technical Specifications - System Board section of this document.		
	Each processor supports up to 4 channels of DDR3 memory. To realize full performance at least 1 DIMM must be inserted into each channel.		
	The CPUs determine the speed at which the memory is clocked. If a 1066MHz capable CPU is used in the system, the maximum speed the memory will run at is 1066MHz regardless of the specified speed of the memory.		
	AMO		
	DDR3-1600 ECC Unbuffered DIMMs - AMO		
	HP 8GB (1x8GB) DDR3-1600 ECC RAM	A2Z50AA	
	HP 4GB (1x4GB) DDR3-1600 ECC RAM	A2Z48AA	
	HP 2GB (1x2GB) DDR3-1600 ECC RAM	A2Z47AA	
	DDR3-1866 ECC Unbuffered DIMMs - AMO		
	HP 8GB (1x8GB) DDR3-1866 ECC RAM	E2Q93AA	
	HP 4GB (1x4GB) DDR3-1866 ECC RAM	E2Q91AA	
	HP 2GB (1x2GB) DDR3-1866 ECC RAM	E2Q90AA	
	NOTE: Only unbuffered DDR3 DIMMs are supported.		

Multimedia and Audio Devices	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
Integrated Intel/Realtek HD ALC262 Audio	Y	N		
HP Thin USB Powered Speakers	Y	Y	KK912AA	
Creative Recon3D PCIe Audio Card	Y	Y	B0U68AA	

Supported Components

Optical and Removable Storage

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP 16X DVD-ROM SATA Drive (non Lightscribe)	Y	Y	AR629AA	Note 1
HP 16X DVD+/-RW SuperMulti SATA Drive (non-Lightscribe)	Y	Y	QS208AA	
HP Blu-ray Writer	Y	Y	AR482AA	Note 2
HP 14-in-1 Media Card Reader	Y	Y	E5G19AA	
HP CMT Handle in Top Optical Bay	Y	Y	A9A48AA	Note 3

Actual speeds may vary. Does not permit copying of commercially available DVD movies or other copyright protected materials. Intended for creation and storage of your original material and other lawful uses. Double Layer discs can store more data than single layer discs. However, double-layer discs burned with this drive may not be compatible with many existing single-layer DVD drives and players.

As Blu-ray is a new format containing new technologies, certain disc, digital connection, compatibility and/or performance issues may arise, and do not constitute defects in the product. Flawless playback on all systems is not guaranteed. In order for some Blu-ray titles to play, they may require a DVI or HDMI digital connection and your display may require HDCP support. HD-DVD movies cannot be played on this workstation.

NOTE 1: Not supported as a 2nd drive option.
NOTE 2: Cannot be ordered in combination with another Blu-ray Writer.
NOTE 3: The HP CMT Handle in Top Optical Bay kit, which contains two SFF internal drive bays, is installed automatically when customers order a 4th SFF hard drive.

Controller Cards

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP IEEE 1394b FireWire PCIe Card	Y	Y	NK653AA	
HP Thunderbolt-2 PCIe 1-port I/O Card*	Y	Y	F3F43AA	Available early 2014

* Connect in a flash with 4X USB 3.0 bandwidth on an optional high-performance Thunderbolt™ 2.0 port.

Thunderbolt is new technology. Thunderbolt cable and Thunderbolt device (sold separately) must be compatible with Windows. To determine whether your device is Thunderbolt Certified for Windows, see https://thunderbolttechnology.net/products.
Thunderbolt™ 2.0 is planned to be available via an optional add-in card in early 2014.

Supported Components

Networking and Communications

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
Integrated Intel 82579LM PCIe GbE Controller	Y	N		
Intel Gigabit CT Desktop NIC	Y	Y	FH969AA	Note 1
Intel Ethernet I210-T1 PCIe NIC	Y	Y	E0X95AA	
Broadcom NetXtreme Gigabit Ethernet Plus NIC (PCIe)	Y	Y	FS215AA	Notes 1 & 2
HP 361T PCIe Dual Port Gigabit NIC	N	Y	C3N37AA	Note 1
HP Wireless NIC 802.11b/g/n PCIe Card	N	Y	FH971AA	
HP X520 10GbE Dual Port Adapter	Y	Y	C3N52AA	
HP 10GbE SFP+ SR Transceiver	Y	Y	C3N53AA	

NOTE 1:Gigabit" Ethernet indicates compliance with IEEE standard 802.3ab for Gigabit Ethernet and does not connote actual operating speed of 1 Gb/sec. For high speed transmission, connection to a Gigabit Ethernet server and network infrastructure is required.
NOTE 2: This is a PCI Express card based on the Broadcom 5761 chip. This card does not support DASH 1.1 manageability on this platform.

Racking and Physical Security

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Solenoid Hood Lock & Hood Sensor	Y	Y	DE618A	
HP Business PC Security Lock Kit	N	Y	PV606AA	
HP xw4/Z2/Z4 Depth Adjustable Fixed Rail Rack Kit	N	Y	WH340AA	

Input Devices

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP PS/2 Keyboard	Y	Y	QY774AA	
HP PS/2 Mouse	Y	Y	QY775AA	
HP USB Keyboard	Y	Y	QY776AA	
HP USB Smart Card Keyboard	Y	Y	E6D77AA	
HP USB Optical Mouse	Y	Y	QY777AA	
HP USB 1000dpi Laser Mouse	Y	Y	QY778AA	
HP USB Optical 3-Button 2.9M OEM Mouse	N	Y	ET424AA	
HP Wireless Keyboard and Mouse	N	Y	QY449AA	
HP SpaceMouse Pro USB 3D Input Device	N	Y	B4A20AA	
HP SpacePilot Pro 3D USB Intelligent Controller	N	Y	WH343AA	

Product numbers QY774AA-QY778AA represent the new 2012 products with the updated product design. The previous models will be phased out over time

Supported Components

Other Hardware

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Z420 Front Memory Duct	Y	Y	C4J29AA	Note 1
HP Z4 Fan and Front Card Guide Kit	Y	Y	A2Z46AA	
HP Serial Port Adapter	Y	Y	PA716A	
HP eSATA PCI Cable Kit	Y	Y	GM110AA	
HP Internal USB Port Kit	N	Y	EM165AA	Note 2
HP Optical Bay HDD Mounting Bracket	N	Y	NQ099AA	
HP Power Cord Kit	N	Y	DM293A	
Configure minitower in desktop orientation	Y	N		
HP Workstation Mouse Pad	Y	N		Japan only
HP Energy Star Enabled Configuration	Y	N		

Note 1: The HP Z420 Front Memory Duct is available to add to any configuration for improved system cooling, but is required for 4 x 8GB and 8 x 8GB memory configurations and for configurations including the HP Liquid Cooling Solution thermal kit.
Note 2: The HP Internal USB Port kit has a single USB 2.0 type A connector.

Software

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Performance Advisor	Y	Y		Note 1
HP Remote Graphics Software (RGS) 6.0	Y	N		Note 2
HP ProtectTools Security	Y	N		Note 3
MS Office Home & Business 2013	Y	N		Note 4
HP Power Assistant	Y	N		
PDF Complete - Corporate Edition	Y	N		
Cyberlink Media Suite & PowerDVD	Y	N		Media playback/ authoring software

NOTE 1: Available as a free download here: www.hp.com/go/performanceadvisor
NOTE 2: Supports both 32 and 64 bit versions of Windows 7 Professional and Enterprise, Windows XP Professional and Enterprise, and RHEL V6
NOTE 3: Must select as a Configure to Order option. Delivered as a "Drop in the Box" CD
NOTE 4: Must select as a Configure to Order option

Supported Components

Operating Systems	Support Notes
Windows 8.1 Pro 64-bit	
Windows 8.1 Simplified Chinese Edition 64-bit	
Windows 8.1 Pro Downgrade to Windows 7 Professional 64-bit	
Windows 8.1 Pro Downgrade to Windows 7 Professional 32-bit	
Windows 8.1 Pro Downgrade to Windows 7 Professional 64-bit (National Academic)	
Windows 8.1 Pro Downgrade to Windows 7 Professional 32-bit (National Academic)	
Windows 8 Pro 64-bit	
Windows 8 Simplified Chinese Edition 64-bit	
Windows 8 Pro Downgrade to Windows 7 Professional 32-bit	
Windows 8 Pro Downgrade to Windows 7 Professional 64-bit	
Genuine Windows® 7 Ultimate 64-bit	Note 1
Genuine Windows® 7 Professional 32-bit	Note 1
Genuine Windows® 7 Professional 64-bit	Note 1
SUSE Linux Enterprise Desktop 11	
HP Linux Installer Kit	
Red Hat Enterprise Linux (RHEL) Workstation - Paper License (1yr)	Note 2

NOTE 1: See http://www.microsoft.com/windows/windows-7/ for support details.
NOTE 2: This second OS must be ordered with the HP Linux Installer Kit as the first OS.

System Board	
System Board Form Factor	ATX 243.84 x 304.8 mm (9.6 x 12 inches)
Processor Socket	Single LGA2011
CPU Bus Speed	QPI: Up to 8.0GT/sec
Chipset	Intel® C602 Chipset
Super I/O Controller	Nuvoton NPCD379H (SIO-12)
Memory Expansion Slots	8 DDR3 memory slots
Memory Type Supported	DDR3, UDIMM (Unbuffered), ECC
Memory Modes	Channel Interleaved
Memory Speed Supported	1066MHz, 1333MHz, 1600MHz, and 1866MHz
Memory Protection	ECC available on data, parity on address and command
Memory	
Memory Configuration Table	Please refer to the table below for details on how supported memory configurations are installed in your system.

		Front Slots				Rear Slots			
Capacity (GB)	**Type**	**DIMM 1**	**DIMM 2**	**DIMM 3**	**DIMM 4**	**DIMM 5**	**DIMM 6**	**DIMM 7**	**DIMM 8**
2	**UDIMM**	**2GB**							
4	**UDIMM**	**2GB**							**2GB**
6	**UDIMM**	**2GB**		**2GB**					**2GB**
8	**UDIMM**	**2GB**		**2GB**			**2GB**		**2GB**
16	**UDIMM**	**2GB**	**2GB**	**2GB**	**2GB**	**2GB**	**2GB**	**2GB**	**2GB**
4	**UDIMM**	**4GB**							
8	**UDIMM**	**4GB**							**4GB**
12	**UDIMM**	**4GB**		**4GB**					**4GB**
16	**UDIMM**	**4GB**		**4GB**			**4GB**	**4GB**	**4GB**
32	**UDIMM**	**4GB**	**4GB**	**4GB**	**4GB**	**4GB**	**4GB**	**4GB**	**4GB**
8	**UDIMM**	**8GB**							
16	**UDIMM**	**8GB**							**8GB**
24	**UDIMM**	**8GB**		**8GB**					**8GB**
32	**UDIMM**	**8GB**		**8GB**			**8GB**		**8GB**
64	**UDIMM**	**8GB**	**8GB**	**8GB**	**8GB**	**8GB**	**8GB**	**8GB**	**8GB**
Slot Load Order		**1**	**5**	**3**	**7**	**8**	**4**	**6**	**2**

For a detailed diagram, please refer to the label located on the inside of the system side panel.

Maximum Memory	Supports up to 64GB
Memory Configuration (Supported)	Only ECC DIMMs are supported.

System Technical Specifications

Note on Maximum Memory	*Maximum memory capacities assume 64-bit operating systems such as Genuine Windows® 7 Ultimate 64-bit or Genuine Windows® 7 Professional 64-bit. Genuine Windows® 7 Professional 32-bit supports up to 4GB. Linux 32-bit supports up to 8GB.	
PCI Express Connectors	2 x16 PCIe Gen3 1 x8 PCIe Gen3 1 x8 PCIe (x4) Gen2 1 x4 PCIe (x1) Gen2	
PCI Connectors (5.0V)	1 PCI	
Supported Drive Interfaces	**SATA**	Integrated 6-channel SATA interface (2@6Gb/s, 4@3Gb/s). Supports RAID 0, 1, 5, 10 and NCQ. Factory integrated RAID is Microsoft Windows only.
	Integrated RAID	**NOTE:** Requires identical hard drives (speeds, capacity, interface)
Integrated Graphics	No	
Network Controller	Integrated Intel 82579 Gbit LAN Supports the following management functionalities: Intel AMT7.0, TXT, DASH 1.1, WOL, and PXE 2.1	
External SATA (eSATA)	6 ports are eSATA configurable with optional eSATA After-Market Option cable kit.	
IDE connector	No	
Floppy connector	No	
Serial	1 internal header	
2nd Serial	No	
Parallel	No	
AUX IN (audio)	No	
IEEE 1394 Connector(s)	**Front**	1 IEEE 1394a standard
	Rear	1 IEEE 1394a standard; 2 IEEE 1394b (requires optional PCIe card)
	Internal	No
USB Connector(s)	**Front**	2 USB 3.0 1 USB 2.0
	Rear	2 USB 3.0 4 USB 2.0
	Internal	6 USB 2.0 ports available by three separate 2x5 headers: each header supports either one HP Internal USB Port Kit or one USB Media Card Reader. Each Internal Port Kit has one USB 2.0 connector.
HD Integrated Audio	Realtek ALC262	
Flash ROM	Yes	
CPU Fan Header	Yes	
Chasiss Fan Header	1 Rear System Chassis Fan Header	
Front PCI Fan Header	Yes	
Front Control Panel/Speaker Header	Yes	
CMOS Battery Holder - Lithium	Yes	

System Technical Specifications

Integrated Trusted Platform Module	Integrated TPM 1.2
Power Supply Headers	Yes
Power Switch, Power LED & Hard Drive LED Header	Yes
Clear Password Jumper	Yes
Serial Port	1 internal header
Parallel Port	No
Keyboard/Mouse	USB or PS/2

Power Supply

Power Supply	**600W 90% Efficient, Custom PSU (Wide Ranging, Active PFC)**	
Operating Voltage Range	**90–269 VAC**	
Rated Voltage Range	**100–240 V**	**118 V**
Rated Line Frequency	**50–60 Hz**	**400 Hz**
Operating Line Frequency Range	**47–66 Hz**	**393-407 Hz**
Rated Input Current	**100–240 V @ 8.0 A**	**118 V @ 8.0 A**
Heat Dissipation	**Typical: 1365btu/hr (344 kg-cal/hr) Maximum: 2354btu/hr (593 kg-cal/hr)**	
Power Supply Fan	**92x25 mm variable speed**	
ENERGY STAR Qualified (Configuration dependent)	**Yes**	
80 PLUS® Compliant	**90% Efficient** **The Z420 600W power supply efficiency report can be found at this link: http://www.plugloadsolutions.com/psu_reports/HEWLETT PACKARD_623193-001_ECOS 2619 1_600W_Report.pdf**	
FEMP Standby Power Compliant @115V (Wake-on LAN disabled) (<2W in S5 - Power Off)	**Yes**	
EuP Compliant @ 230V (<1 W in S5 - Power Off)	**Yes**	
CECP Compliant @ 220V (<4W in S3 - Suspend to RAM)	**Yes; Configuration dependent**	
Power Consumption in sleep mode (as defined by ENERGY STAR) - Suspend to RAM (S3) (Instantly Available PC) measured at 115V.	**<10W**	
Built-in Self Test LED	**Yes**	
Surge Tolerant Full Ranging Power Supply (withstands power surges up to 2000V)	**Yes**	

System Technical Specifications

Hood Lock Header	**Yes**
Hood Sensor Header	**Yes**
Memory Fan	**1 Memory Fan Header**

System Configurations							
Example Configuration #1 (ENERGY STAR QUALIFIED)	Processor Info Memory Info Graphics Info Disks/Optical/Floppy PSU Other	1x Intel Xeon E5-1603 (Quad-Core) 1x 2GB DDR3 1600 (UDIMM) 1x NVIDIA NVS 300 1x 250GB SATA 7200/1x 16X DVD-ROM SATA 600W 90% Custom PSU -					
Energy Consumption		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	50.0 W		48.9 W		49.5 W	
	Windows Busy Typ (S0)	118 W		115 W		118 W	
	Windows Busy Max (S0)	130 W		127 W		129 W	
	Sleep (S3)	3.56 W	3.42 W	3.782 W	3.66 W	3.53 W	3.41 W
	Off (S5)	1.34 W	1.20 W	1.58 W	1.45 W	1.31 W	1.18 W
	Zero Power Mode (ErP)	0.20 W		0.43 W		0.17 W	
Heat Dissipation**		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	171 btu/hr		167 btu/hr		169 btu/hr	
	Windows Busy Typ (S0)	403 btu/hr		392 btu/hr		403 btu/hr	
	Windows Busy Max (S0)	444 btu/hr		433 btu/hr		440 btu/hr	
	Sleep (S3)	12.2 btu/hr	11.7 btu/hr	12.9 btu/hr	12.5 btu/hr	12.0 btu/hr	11.6 btu/hr
	Off (S5)	4.57 btu/hr	4.09 btu/hr	5.39 btu/hr	4.95 btu/hr	4.47 btu/hr	4.03 btu/hr
	Zero Power Mode (ErP)	0.68 btu/hr		1.47 btu/hr		0.58 btu/hr	

Example Configuration #2 (ENERGY STAR QUALIFIED)	Processor Info Memory Info Graphics Info Disks/Optical/Floppy Power Supply Other	1x Intel Xeon E5-1650 (Six-Core) 2x 4GB DDR3 1600 (UDIMM) 1x NVIDIA Quadro 2000 2x 500GB SATA 7200/1x 16X DVD+-RW SuperMulti SATA 600W 90% Custom PSU -					
Energy Consumption		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	73.9 W		72.9 W		73.8 W	
	Windows Busy Typ (S0)	272 W		270 W		277 W	
	Windows Busy Max (S0)	298 W		294 W		300 W	
	Sleep (S3)	4.31 W	4.18 W	4.53 W	4.41 W	4.27 W	4.17 W
	Off (S5)	1.35 W	1.20 W	1.59 W	1.44 W	1.32 W	1.17 W
	Zero Power Mode (ErP)	0.21 W		0.43 W		0.17 W	
Heat Dissipation**		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	252 btu/hr		249 btu/hr		252 btu/hr	
	Windows Busy Typ (S0)	928 btu/hr		921 btu/hr		945 btu/hr	

System Technical Specifications

	Windows Busy Max (S0)	1017 btu/hr		1003 btu/hr		1024 btu/hr	
	Sleep (S3)	14.7 btu/hr	14.3 btu/hr	15.5 btu/hr	15.1 btu/hr	14.6 btu/hr	14.2 btu/hr
	Off (S5)	4.61 btu/hr	4.09 btu/hr	5.43 btu/hr	4.91 btu/hr	4.50 btu/hr	3.99 btu/hr
	Zero Power Mode (ErP)	0.72 btu/hr		1.47 btu/hr		0.58 btu/hr	

Example Configuration #3	Processor Info Memory Info Graphics Info Disks/Optical/Floppy Power Supply Other	1x Intel Xeon E5-2665 (Eight-Core) 8x 4GB DDR3 1600 (UDIMM) 1x NVIDIA Quadro 5000 4x 600GB SAS 15K/1x 16X DVD+-RW SuperMulti SATA 600W 90% Custom PSU LSI 9212 SAS Card					
Energy Consumption		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	152 W		151 W		154 W	
	Windows Busy Typ (S0)	347 W		346 W		354 W	
	Windows Busy Max (S0)	421 W		430 W		432 W	
	Sleep (S3)	6.77 W	6.68 W	6.96 W	6.82 W	6.79 W	6.63 W
	Off (S5)	1.33 W	1.20 W	1.55 W	1.42 W	1.30 W	1.18 W
	Zero Power Mode (ErP)	0.19 W		0.41 W		0.16 W	
Heat Dissipation**		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	519 btu/hr		515 btu/hr		525 btu/hr	
	Windows Busy Typ (S0)	1184 btu/hr		1181 btu/hr		1208 btu/hr	
	Windows Busy Max (S0)	1437 btu/hr		1467 btu/hr		1474 btu/hr	
	Sleep (S3)	23.1 btu/hr	23.8 btu/hr	23.8 btu/hr	23.3 btu/hr	23.2 btu/hr	22.6 btu/hr
	Off (S5)	4.54 btu/hr	4.09 btu/hr	5.29 btu/hr	4.85 btu/hr	4.44 btu/hr	4.03 btu/hr
	Zero Power Mode (ErP)	0.65 btu/hr		1.40 btu/hr		0.55 btu/hr	

Declared Noise Emissions (Entry-level and High-end configurations)		
System Configuration (Entry level)	**Processor Info**	Intel Xeon E5-2665 2.40 GHz
	Memory Info	4 - DDR3 2 GB 1600 MHz UDIMM
	Graphics Info	NVIDIA Q400
	Disks/Optical/Floppy	Single 500 GB 7200 RPM SATA DVD-RW

Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)		**Sound Power** (LWAd, bels)	**Deskside Sound Pressure** (LpAm, decibels
	Idle	3.5	18
	SATA Hard drive Operating (random reads)	3.6	19
	DVD-ROM Operating (sequential reads)	5.2	37

System Technical Specifications

System Configuration (High-end)	**Processor Info**	Intel Xeon E5-1660 3.30 GHz
	Memory Info	8 - 4 GB DDR3 1600 MHz UDIMM
	Graphics Info	NVIDIA Q4000
	Disks/Optical/Floppy	2 - 600 GB 15K RPM SAS 3.5" DVD-RW

Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)		**Sound Power** (LWAd, bels)	**Deskside Sound Pressure** (LpAm, decibels
	Idle	4.9	32
	SATA Hard drive Operating (random reads)	5.0	34
	DVD-ROM Operating (sequential reads)	5.3	41

Environmental Requirements	**Temperature**	Operating: 5° to 35° C (40° to 95° F) Non-operating: -40° to 60° C (-40° to 140° F)
	Humidity	Operating: 8% to 85% RH, non-condensing Non-operating: 8% to 90% RH, non-condensing
	Maximum Altitude	Operating: 3,000 m (10,000 feet) Non-operating: 9,100 m (30,000 feet)
	Dynamic (new)	Shock Operating: ½-sine: 40g, 2-3ms (~62 cm/sec) Non-operating: ½-sine: 160 cm/s, 2-3ms (~105g) square: 422 cm/s, 20g **NOTE:** Values represent individual shock events and do not indicate repetitive shock events. Vibration Operating random: 0.5g (rms), 5-300 Hz, up to 0.0025g²/Hz Non-operating random: 2.0g (rms), 5-500 Hz, up to 0.0150 g²/Hz **NOTE:** Values do not indicate continuous vibration.
	Cooling	Above 1524 m (5,000 ft) altitude, maximum operating temperature is de-rated by 1° C (1.8° F) per 305 m (1,000 ft) elevation increase

Physical Security and Serviceability	
Access Panel	Tool-less Includes system board and memory information.
Optical Drive	Tool-less
Hard Drives	Tool-less
Expansion Cards	Tool-less
Processor Socket	Tool-less
Green User Touch Points	Yes, on primary serviceable components.

System Technical Specifications

Color-coordinated Cables and Connectors	Yes
Memory	Tool-less
System Board	Screw-In
Dual Color Power and HD LED on Front of Computer	Yes
Configuration Record SW	Yes
Over-Temp Warning on Screen	Yes, at POST screen on reboot
Restore CD/DVD Set	Restores the computer to its original factory shipping image; can be obtained via HP Support.
Dual Function Front Power Switch	Yes, causes a fail-safe power off when held for 4 seconds
Padlock Support	Yes (optional): Locks side cover and secures chassis from theft 5.56 mm (0.2188 in) diameter padlock loop at rear of system
Cable Lock Support	Yes, Kensington Cable Lock (optional): Locks side cover and secures chassis from theft 3 mm x 7 mm slot at rear of system
Universal Chassis Clamp Lock Support	Yes (optional): Locks side cover and locks cables to chassis. Secures chassis from theft and allows multiple units to be chained together when used with optional cable Threaded feature at rear of system
Solenoid Lock and Hood Sensor	Yes (optional) The Solenoid Hood Lock eliminates the need for a physical key by making the chassis lockable through software and a password. You can also lock and unlock the chassis remotely over the network. The Sensor Kit detects when the access panel has been removed
Rear Port Control Cover	Yes (optional);locks rear IO cables to prevent cable theft
Serial, Parallel, USB, Audio, Network, Enable/Disable Port Control	Yes, enables or disables serial, USB, audio, and network ports
Removable Media Write/Boot Control	Yes, prevents ability to boot from removable media on supported devices (and can disable writes to media)
Power-On Password	Yes, prevents an unauthorized person from booting up the workstation
Setup Password	Yes, prevents an unauthorized person from changing the workstation configuration
3.3V Aux Power LED on System PCA	Yes
NIC LEDs (integrated) (Green & Amber)	Yes
CPUs and Heatsinks	A T-15 Torx or flat blade screwdriver is needed to remove the CPU heatsink before the CPU can be removed. CPU removal is tool-less
Power Supply Diagnostic LED	Yes
Front Power Button	Yes, ACPI multi-function
Rear Power Button	Yes
Front Power LED	Yes, blue (normal), red (fault)

System Technical Specifications

Front Hard Drive Activity LED	Yes, green
Front ODD Activity LED	Yes
Internal Speaker	Yes
System/Emergency ROM Flash Recovery	Recovers corrupted system BIOS.
Cooling Solutions	Air cooled forced convection, liquid cooling (optional)
Power Supply Fans	92 mm x 92 mm x 25 mm 4-wire (non-serviceable)
CPU Heatsink Fan	92 x 25 mm 5-wire PWM
Chassis Fan	92 mm x 92mm x 25 mm 4-wire PWM
Memory Heatsink Fan	Yes, rear memory
HP Advanced System Diagnostics Offline Edition	HP Vision Diagnostics Offline Edition The diagnostics utility enables you to perform testing and to view critical computer hardware and software configuration information from various sources. This utility enables you to: • Run diagnostics • View the hardware configuration of the system Key features and benefits HP Vision Diagnostics simplifies the process of effectively identifying, diagnosing, and isolating the hardware issues. In addition to robust management tools, service tools can be invaluable in quickly resolving system problems. To streamline the service process and resolve problems quickly, it is necessary to have the right information available at the time that a service call is placed. The primary information requirement, which is also the one that provides the greatest Vision into potential system issues, is the configuration of the system. Vision Diagnostics helps provide higher system availability. Typical uses of the Vision Diagnostics are: • Testing and diagnosing apparent hardware failures • Documenting system configurations for upgrade planning, standardization, inventory tracking, disaster recovery, and maintenance • Sending configuration information to another location for more in-depth analysis
Access Panel Key Lock	No
ACPI-Ready Hardware	Advanced Configuration and Power Management Interface (ACPI). • Allows the system to wake from a low power mode. • Controls system power consumption, making it possible to place individual cards and peripherals in a low-power or powered-off state without affecting other elements of the system
Trusted Platform Module Chip with optional ProtectTools Software	Yes, Infineon SLB9635TT1.2
Integrated Chassis Handles	No Optional Handle in Top Optical Bay kit
Power Supply	Requires T15 Torx or flat blade screwdriver
PCI Card Retention	Yes, rear (all), middle (optional), front (full-length cards with extender, used in with the front card guide and fan holder)

System Technical Specifications

Flash ROM	Yes
Diagnostic Power Switch LED on board	Yes
Clear Password Jumper	Yes
Clear CMOS Button	Yes
CMOS Battery Holder	Yes
DIMM Connectors	Yes
HP ProtectTools Security Manager	Yes - Not supported on Linux

BIOS	
BIOS 32-bit Services	Standard BIOS 32-bit Service Directory Proposal v0.4
PCI 3.0 Support	Full BIOS support for PCI Express through industry standard interfaces.
ATAPI	ATAPI Removable Media Device BIOS Specification Version 1.0.
BBS	BIOS Boot Specification v1.01.
WMI Support	WMI is Microsoft's implementation of Web-Based Enterprise Management (WBEM) for Windows. WMI is fully compliant with the Distributed Management Task Force (DMTF) Common Information Model (CIM) and WBEM specifications
BIOS Boot Spec 1.01+	Provides more control over how and from what devices the workstation will boot.
BIOS Power On	Users can define a specific date and time for the system to power on.
ROM Based Computer Setup Utility (F10)	Review and customize system configuration settings controlled by the BIOS.
System/Emergency ROM Flash Recovery with Video	Recovers system BIOS in corrupted Flash ROM
Replicated Setup	Saves BIOS settings to diskette or USB flash device in human readable file. Repset.exe utility can then replicate these settings on machines being deployed without entering Computer Configuration Utility (F10 Setup).
SMBIOS	System Management BIOS 2.7, for system management information.
Boot Control	Disables the ability to boot from removable media on supported devices.
Memory Change Alert	Alerts management console if memory is removed or changed.
Thermal Alert	Monitors the temperature state within the chassis. Three modes: • NORMAL - normal temperature ranges. • ALERTED - excessive temperatures are detected. Raises a flag so action can be taken to avoid shutdown or provide for a smoother system shutdown. • SHUTDOWN - excessive temperatures are encountered. Automatically shuts down the computer without warning before hardware component damage occurs.
Remote ROM Flash	Provides secure, fail-safe ROM image management from a central network console.

System Technical Specifications

ACPI (Advanced Configuration and Power Management Interface)	Allows the system to enter and resume from low power modes (sleep states). Enables an operating system to control system power consumption based on the dynamic workload. Makes it possible to place individual cards and peripherals in a low-power or powered-off state without affecting other elements of the system. Supports ACPI 2.0 for full compatibility with 64-bit operating systems.
Ownership Tag	A user-defined string stored in non-volatile memory that is displayed in the BIOS splash screen.
Remote Wakeup/ Remote Shutdown	System administrators can power on, restart, and power off a client computer from a remote location.
Instantly Available PC (Suspend to RAM - ACPI sleep state S3)	Allows for very low power consumption with quick resume time.
Remote System Installation via F12 (PXE 2.1) (Remote Boot from Server)	Allows a new or existing system to boot over the network and download software, including the operating system.
ROM revision levels	Reports the system BIOS revision level in Computer Configuration Utility (F10 Setup). Version is available through an industry standard interface (SMBIOS) so that management SW applications can use and report this information.
System board revision level	Allows management SW to read revision level of the system board. Revision level is digitally encoded into the HW and cannot be modified.
Start-up Diagnostics (Power-on Self-Test)	Assesses system health at boot time with selectable levels of testing
Auto Setup when new hardware installed	System automatically detects addition of new hardware.
Keyboard-less Operation	The system can be booted without a keyboard.
Localized ROM Setup	Common BIOS image supports System Configuration Utility (F10 Setup) menus in 12 languages with local keyboard mappings.
Asset Tag	The user or MIS to set a unique tag string in non-volatile memory.
Per-slot Control	Allows I/O slot parameters (option ROM enable/disable, bus latency) to be configured individually.
Adaptive Cooling	Control parameters are set according to detected hardware configuration for optimal acoustics.
Pre-boot Diagnostics	(Pre-video) critical errors are reported via beeps and blinks on the power LED
Industry Standard Specification Support	
UEFI Specification Revision	2.3.1
Industry Standard	Revision Supported by the BIOS
ACPI	Advanced Configuration and Power Management Interface, Version 2.0c
ATA (IDE)	AT Attachment 6 with Packet Interface (ATA/ATAPI-6), Revision 3b
CD Boot	"El Torito" Bootable CD-ROM Format Specification Version 1.0
EDD	• Enhanced Disk Drive Specification Version 1.1 • BIOS Enhanced Disk Drive Specification Version 3.0
EHCI	Enhanced Host Controller Interface for Universal Serial Bus, Revision 1.0

System Technical Specifications

PCI	PCI Local Bus Specification, Revision 2.3 PCI Power Management Specification, Revision 1.1 PCI Firmware Specification, Revision 3.0, Draft .7
PCI Express	PCI Express Base Specification, Revision 2.0 PCI Express Base Specification, Revision 3.0
PMM	POST Memory Manager Specification, Version 1.01
SATA	• Serial ATA Specification, Revision 1.0a • Serial ATA 3 Gb/s: Serial ATA Specification, Revision 2.5 • Serial ATA 6 Gb/s: Serial ATA Specification, Revision 3.0
SPD	PC SDRAM Serial Presence Detect (SPD) Specification, Revision 1.2B
TPM	Trusted Computing Group TPM Specification Version 1.2
UHCI	Universal Host Controller Interface Design Guide, Revision 1.1
USB	Universal Serial Bus Revision 1.1 Specification Universal Serial Bus Revision 2.0 Specification Universal Serial Bus Revision 3.0 Specification
SMBIOS	System Management BIOS Reference Specification, Version 2.7

Social and Environmental Responsibility	
Eco-Label Certifications & Declarations	This product has received or is in the process of being certified to the following approvals and may be labeled with one or more of these marks: • ENERGY STAR® (energy-saving features available on selected configurations-Windows only) • US Federal Energy Management Program (FEMP) • China Energy Conservation Program • IT ECO declaration
Batteries	The battery in this product complies with EU Directive 2006/66/EC Battery size: CR2032 (coin cell) Battery type: Lithium Metal The battery in this product does not contain: • Mercury greater than 5ppm by weight • Cadmium greater than 10ppm by weight • Lead greater than 40ppm by weight
Restricted Material Usage	This product meets the material restrictions specified in HP's General Specification for the Environment. http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/gse.pdf Hewlett-Packard is committed to compliance with all applicable environmental laws and regulations, including the European Union Restriction of Hazardous Substances (RoHS) Directive. HP's goal is to exceed compliance obligations by meeting the requirements of the RoHS Directive on a worldwide basis.
Low Halogen Statement	This product is low halogen except for power cords, cables and peripherals, as well as the following customer-configurable internal components: 3 ½" SAS HDDs, LSI 9260-8i SAS 6Gb/s ROC RAID Card, Creative Recon3D PCIe Audio Card, Liquid Cooling Solution, and Broadcom 5761 Gigabit PCIe NIC are not Low Halogen. Service parts obtained after purchase may not be Low Halogen.

System Technical Specifications

End-of-Life Management and Recycling	Hewlett-Packard offers end-of-life HP product return and recycling programs in many geographic areas. To recycle your product, please go to: http://www.hp.com/recycle or contact your nearest HP sales office. Products returned to HP will be recycled, recovered or disposed of in a responsible manner. This product is greater than 90% recyclable by weight when properly disposed of at end of life.
Hewlett-Packard Corporate Environmental Information	For more information about HP's commitment to the environment: Global Citizenship Report http://www.hp.com/hpinfo/globalcitizenship/gcreport/index.html
Additional Information	This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive - 2002/96/EC. ● Plastic parts weighing over 25 grams used in the product are marked per ISO 11469 and ISO1043. ● This product is >90% recycle-able when properly disposed of at end of life. EPEAT Gold registered in the U.S. EPEAT registration varies by country. See www.epeat.net for registration status by country
Packaging	HP Workstation product packaging meets the HP General Specification for the Environment at http://www.hp.com/hpinfo/globalcitizenship/society/gen_specifications.html ● Does not contain restricted substances listed in HP Standard 011-1 General Specification for the Environment ● Does not contain ozone-depleting substances (ODS) ● Does not contain heavy metals (lead, mercury, cadmium or hexavalent chromium) in excess of 100 ppm sum total for all heavy metals listed ● Maximizes the use of post-consumer recycled content materials in packaging materials ● All packaging material is recyclable ● All packaging material is designed for ease of disassembly ● Reduced size and weight of packages to improve transportation fuel efficiency ● Plastic packaging materials are marked according to ISO 11469 and DIN 6120 standards formatting
Packaging Materials	
Internal	Cushions and plastic bags made of low density polyethylene (LDPE).
External	Outer carton, accessories carton, and insert made of corrugated paper board.

Manageability	
Industry Standard Specifications	This product meets the following industry standard specifications for manageability functionality: ● DASH 1.1 required functionalities via Intel LAN on motherboard
Intel Active Management Technology (AMT)	Intel Active Management Technology (AMT) 7.0 An advanced set of remote management features and functionality providing IT administrators the latest and most effective tools to remotely discover, heal, and protect networked client systems regardless of the system's health or power state. AMT 7.0 includes the following advanced management functions: ● Power Management (on, off, reset) ● Hardware Inventory (includes BIOS and firmware revisions) ● Hardware Alerting ● Agent Presence ● System Defense Filters ● SOL/IDER ● Cisco NAC/SDN Support

	• ME Wake-on-LAN • DASH 1.1 compliance • IPv6 Support • Fast Call for Help - a client inside or outside the firewall may initiate a call for help via BIOS screen, periodic connections, or alert triggered connection • Remote Scheduled Maintenance - pre-schedule when the system connects to the IT or service provider console for maintenance. • Remote Alerts - automatically alert IT or service provider if issues arise • Access Monitor - Provides oversight into Intel® AMT actions to support security requirements • PC Alarm Clock • Microsoft NAP Support • Host Base set-up and configuration • Management Engine (ME) firmware roll back
Intel® vPro™ Technology	The HP Z420 Workstation supports Intel vPro technology when configured as outlined below: • Intel Xeon processor E5-1600 product family or E5-2600 product family featuring Intel vPro Technology • Intel C602 chipset • Intel 82579LM GbE LAN
Remote Manageability Software Solutions	The HP Z420 Workstation is supported on the following remote manageability software consoles: • LANDesk Management Suite (HP recommended solution) • Microsoft System Center Configuration Manager • HP Client Automation Enterprise For questions or support for manageability needs, please visit http://www.hp.com/go/easydeploy
System Software Manager	For questions or support for SSM, please visit: http://www.hp.com/go/ssm
Service, Support, and Warranty	On-site Warranty and Service (Note 1): Three-years, limited warranty and service offering delivers on-site, next business-day (Note 2) service for parts and labor and includes free telephone support (Note 3) 8am - 5pm. Global coverage (Note 2) ensures that any product purchased in one country and transferred to another, non-restricted country will remain fully covered under the original warranty and service offering. **NOTE 1:** Terms and conditions may vary by country. Certain restrictions and exclusions apply. **NOTE 2**: On-site service may be provided pursuant to a service contract between HP and an authorized HP third-party provider, and is not available in certain countries. Global service response times are based on commercially reasonable best effort and may vary by country. **NOTE 3:** Technical telephone support applies only to HP-configured, HP and HP-qualified, third-party hardware and software. Toll-free calling and 24x7 support service may not be available in some countries. HP Care Pack Services extend service contracts beyond the standard warranties. Service starts from date of hardware purchase. To choose the right level of service for your HP product, use the HP Care Pack Services Lookup Tool at http://www.hp.com/go/lookuptool. Additional HP Care Pack Services information by product is available at http://www.hp.com/hps/carepack. Service levels and response times for HP Care Packs may vary depending on your geographic location.
Product Change Notification	• Program to proactively communicate Product Change Notifications (PCNs) and Customer Advisories by email to customers, based on a user-defined profile. • PCNs provide advance notification of hardware and software changes to be implemented in the factory providing time to plan for transition. • Customer Advisories provide concise, effective problem resolution, greatly reducing the need to call technical support.

Stable & Consistent Offerings

As part of its commitment to hardware, software, and solution innovation, HP is proud to introduce this breakthrough platform configuration stability to HP Workstation customers. HP Stable & Consistent Offerings are built on the foundation of a carefully chosen set of hardware and software designed and tested to work with all HP Z Workstation platforms through their end of life. These components and their corresponding HP Workstation platform compatibility are outlined in this section.

HP Stable & Consistent Offerings are available worldwide to all HP Workstation customers-no special programs, no additional cost, no kidding. Simply select your hardware and software components when you customize your HP Workstation and be assured that you'll be able to buy that same configuration throughout the lifecycle of the product.

Processors	Product #	Offering
	A2H76AV	Intel® Xeon® Processor E5-1620 4C 3.60GHz
	E2R01AV	Intel® Xeon® Processor E5-1620v2 4C 3.70GHz

Hard Drives	Product #	Offering
	QE198AV	HP 500 GB SATA 7200 1st HDD
	QE199AV	HP 500 GB SATA 7200 2nd HDD
	QE200AV	HP 500 GB SATA 7200 3rd HDD
	QE201AV	HP 500 GB SATA 7200 4th HDD
	QE190AV	HP 1 TB SATA 7200 1st HDD
	QE191AV	HP 1 TB SATA 7200 2nd HDD
	QE192AV	HP 1 TB SATA 7200 3rd HDD
	QE193AV	HP 1 TB SATA 7200 4th HDD

Graphics	Product #	Offering
	A7U44AV	NVIDIA NVS 310 512MB Graphics
	A7U45AV	NVIDIA NVS 310 512MB Graphics (2nd)

Memory	Product #	Offering
	QE252AV	2GB (1x2GB) DDR3-1600 ECC Unbuffered RAM
	QE254AV	4GB (2x2GB) DDR3-1600 ECC Unbuffered RAM
	B0Q75AV	6GB (3x2GB) DDR3-1600 ECC Unbuffered RAM
	QE256AV	8GB (4x2GB) DDR3-1600 ECC Unbuffered RAM
	QE258AV	16GB (8x2GB) DDR3-1600 ECC Unbuffered RAM
	E4W55AV	8GB (2x4GB) DDR3-1600 ECC Unbuffered RAM
	QE257AV	16GB (4x4GB) DDR3-1600 ECC Unbuffered RAM
	QE260AV	32GB (8x4GB) DDR3-1600 ECC Unbuffered RAM
	E6R36AV	4GB (1x4GB) DDR3-1866 ECC Unbuffered RAM
	E2S39AV	8GB (2x4GB) DDR3-1866 ECC Unbuffered RAM
	E2S41AV	12GB (3x4GB) DDR3-1866 ECC Unbuffered RAM
	E2S43AV	16GB (4x4GB) DDR3-1866 ECC Unbuffered RAM

Stable & Consistent Offerings

	E2S45AV	32GB (8x4GB) DDR3-1866 ECC Unbuffered RAM

Optical and Removable Storage	Product #	Offering
	QE236AV	HP 16X DVD+-RW SuperMulti SATA 1st Drive
	QE237AV	HP 16X DVD+-RW SuperMulti SATA 2nd Drive

Operating Systems	Product #	Offering
	QD971AV	Genuine Windows® 7 Professional 64-bit

Introduction

Intel® Xeon® Processor E5-1620 4C 3.60GHz

Intel® Xeon® Processor E5-1603 4C 2.80GHz

Processor Note

For detailed processor specifications, please refer to the Overview section at the beginning of this document.

Intel® Xeon® Processor E5-2650 v2 8C 2.60GHz

Intel® Xeon® Processor E5-1607 v2 4C 3.00GHz

Intel® Xeon® Processor E5-1620 v2 4C 3.70GHz

Intel® Xeon® Processor E5-1650 v2 6C 3.50GHz

Intel® Xeon® Processor E5-1660 v2 6C 3.70GHz

Intel® Xeon® Processor E5-1680 v2 8C 3.00GHz

Technical Specifications - Hard Drives

HP SAS (Serial Attached SCSI) Hard Drives for HP Workstations	**600GB SAS 15K rpm 6Gb/s 3.5" HDD**	**Capacity**	600GB	
		Height	1 in; 2.54 cm	
		Width	**Media Diameter**	3.5 in; 8.9 cm
			Physical Size	4 in; 10.17 cm
		Interface	SAS	
		Synchronous Transfer Rate (Maximum)	6.0 Gb/s	
		Buffer	16 MB	
		Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	0.2 ms
			Average	3.4 ms
			Full Stroke	6.6 ms
		Rotational Speed	15,000 rpm	
		Logical Blocks	1,172,123,568 - 512 byte blocks	
		Operating Temperature	50° to 95° F (10° to 35° C)	
	450GB SAS 15K rpm 6Gb/s 3.5" HDD	**Capacity**	450GB	
		Height	1 in; 2.54 cm	
		Width	**Media Diameter**	3.5 in; 8.9 cm
			Physical Size	4 in; 10.17 cm
		Interface	SAS	
		Synchronous Transfer Rate (Maximum)	6Gb/s	
		Buffer	16MB	
		Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	0.2 ms
			Average	3.4 ms
			Full Stroke	6.6 ms
		Rotational Speed	15,000 rpm	
		Operating Temperature	50° to 95° F (10° to 35° C)	
	300GB SAS 15K rpm 6Gb/s 3.5" HDD	**Capacity**	300GB	
		Height	1 in; 2.54 cm	
		Width	**Media Diameter**	3.5 in; 8.9 cm
			Physical Size	4 in; 10.17 cm
		Interface	SAS	
		Synchronous Transfer Rate (Maximum)	6Gb/s	
		Buffer	16MB	

	Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	0.2 ms
		Average	3.4 ms
		Full Stroke	6.6 ms
	Rotational Speed	15,000 rpm	
	Operating Temperature	50° to 95° F (10° to 35° C)	
HP 300GB SAS 10K SFF HDD	**Capacity**	300GB	
	Height	0.6 in; 1.53 cm	
	Width	**Media Diameter**	2.5 in; 6.36 cm
		Physical Size	2.75 in; 6.99 cm
	Interface	SAS 6Gb/s	
	Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
	Buffer	64MB	
	Cache	multi-segmentable cache buffer	
	Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	0.4 ms (max)
		Average	3.6 ms
		Full Stroke	7.3 ms
	Rotational Speed	10,000 rpm	
	Logical Blocks	585,937,500	
	Operating Temperature	41° to 131° F (5° to 55° C)	
HP 600GB SAS 10K SFF HDD	**Capacity**	600GB	
	Height	0.6 in; 1.53 cm	
	Width	**Media Diameter**	2.5 in; 6.36 cm
		Physical Size	2.75 in; 6.99 cm
	Interface	SAS 6Gb/s	
	Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
	Buffer	64MB	
	Cache	multi-segmentable cache buffer	
	Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	0.4 ms (max)
		Average	3.6 ms
		Full Stroke	7.3 ms
	Rotational Speed	10,000 rpm	
	Logical Blocks	1,172,123,568	
	Operating Temperature	41° to 131° F (5° to 55° C)	

Technical Specifications - Hard Drives

	HP 900GB SAS 10K SFF HDD	**Capacity**	900GB	
		Height	0.6 in; 1.53 cm	
		Width	**Media Diameter**	2.5 in; 6.36 cm
			Physical Size	2.75 in; 6.99 cm
		Interface	SAS 6Gb/s	
		Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
		Buffer	64MB	
		Cache	multi-segmentable cache buffer	
		Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	0.2ms (max)
			Average	3.5 ms
			Full Stroke	7.0 ms
		Rotational Speed	10,000 rpm	
		Logical Blocks	1,758,174,767	
		Operating Temperature	41° to 131° F (5° to 55° C)	
	HP 1.2TB SAS 10K SFF HDD	**Capacity**	1.2TB	
		Height	0.6 in; 1.53 cm	
		Width	**Media Diameter**	2.5 in; 6.36 cm
			Physical Size	2.75 in; 6.99 cm
		Interface	SAS 6Gb/s	
		Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
		Buffer	64MB	
		Cache	multi-segmentable cache buffer	
		Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	0.18ms (max)
			Average	3.5ms
			Full Stroke	7.17ms
		Rotational Speed	10,000 rpm	
		Logical Blocks	2,344,225,968	
		Operating Temperature	41° to 131° F (5° to 55° C)	
SATA (Serial ATA) Hard Drives for HP Workstations	**250GB SATA 10K rpm SFF HDD**	**Capacity**	250GB	
		Height	0.6 in; 1.53 cm	
		Width	**Media Diameter**	2.5 in; 6.36 cm
			Physical Size	2.75 in; 6.99 cm
		Interface	Serial ATA (6Gb/s)	

Technical Specifications - Hard Drives

	Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
	Buffer	64MB	
	Cache	Adaptive	
	Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	1.2ms (typical)
		Average	3.6ms
		Full Stroke	9.0ms (typical)
	Rotational Speed	10K rpm	
	Operating Temperature	41° to 131° F (5° to 55° C)	
500GB SATA 10K rpm SFF HDD	**Capacity**	500GB	
	Height	0.6 in; 1.53 cm	
	Width	**Media Diameter**	2.5 in; 6.36 cm
		Physical Size	2.75 in; 6.99 cm
	Interface	Serial ATA (6Gb/s)	
	Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
	Buffer	64MB	
	Cache	Adaptive	
	Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	1.2ms (typical)
		Average	3.6ms
		Full Stroke	9.0ms (typical)
	Rotational Speed	10K rpm	
	Operating Temperature	41° to 131° F (5° to 55° C)	
1TB SATA 10K rpm SFF HDD	**Capacity**	1TB	
	Height	0.6 in; 1.53 cm	
	Width	**Media Diameter**	2.5 in; 6.36 cm
		Physical Size	2.75 in; 6.99 cm
	Interface	Serial ATA (6Gb/s)	
	Synchronous Transfer Rate (Maximum)	Up to 600 MB/s	
	Buffer	64MB	
	Cache	Adaptive	
	Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	1.2ms (typical)
		Average	3.6ms
		Full Stroke	9.0ms (typical)
	Rotational Speed	10K rpm	
	Operating Temperature	41° to 131° F (5° to 55° C)	

Technical Specifications - Hard Drives

500GB SATA 7200 rpm 6Gb/s 3.5" HDD	**Capacity**	500GB	
	Height	1 in; 2.5 cm	
	Width	**Media Diameter**	3.5 in; 8.9 cm
		Physical Size	4 in; 10.17 cm
	Interface	Serial ATA (6.0Gb/s), NCQ enabled	
	Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
	Buffer	16 MB	
	Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	2 ms
		Average	11 ms
		Full Stroke	21 ms
	Rotational Speed	7,200 rpm	
	Logical Blocks	976,773,168	
	Operating Temperature	41° to 131° F (5° to 55° C)	
1TB SATA 7200 rpm 6Gb/s 3.5" HDD	**Capacity**	1 Terabyte (1000 GB)	
	Height	1 in; 2.54 cm	
	Width	**Media Diameter**	3.5 in; 8.9 cm
		Physical Size	4.0 in; 10.17 cm
	Interface	Serial ATA (6.0Gb/s), NCQ enabled	
	Synchronous Transfer Rate (Maximum)	Up to 600 MB/s	
	Buffer	32MB	
	Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	2 ms
		Average	11 ms
		Full Stroke	21 ms
	Rotational Speed	7,200 rpm	
	Logical Blocks	1,953,525,168	
	Operating Temperature	41° to 131° F (5° to 55° C)	
2.0TB SATA 7200 rpm 6Gb/s 3.5" HDD	**Capacity**	2.0TB	
	Height	1 in; 2.54 cm	
	Width	**Media Diameter**	3.5 in; 8.9 cm
		Physical Size	4 in; 10.17 cm
	Interface	Serial ATA (6.0 Gb/s), NCQ Enabled	
	Synchronous Transfer Rate (Maximum)	Up to 600 MB/s	
	Buffer	64MB	

	Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	1.0 ms
		Average	11 ms
		Full Stroke	18 ms
	Rotational Speed	7,200 rpm	
	Logical Blocks	3,907,029,168	
	Operating Temperature	41° to 131° F (5° to 55° C)	
3.0TB SATA 7200 rpm 6Gb/s 3.5" HDD	**Capacity**	3.0TB	
	Height	1 in; 2.54 cm	
	Width	**Media Diameter**	3.5 in; 8.9 cm
		Physical Size	4.0 in; 10.17 cm
	Interface	Serial ATA (6.0Gb/s), NCQ enabled	
	Synchronous Transfer Rate (Maximum)	Up to 6.0 Gb/s	
	Buffer	64MB	
	Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	0.6 ms
		Average	11 ms
		Full Stroke	Not Specified
	Rotational Speed	7,200 rpm	
	Operating Temperature	41° to 140° F (5° to 60° C)	
500GB SATA 7.2K SED SFF HDD	**Capacity**	500GB	
	Height	0.275 in; 0.7 cm	
	Width	**Media Diameter**	2.5 in; 6.36 cm
		Physical Size	2.75 in; 6.99 cm
	Interface	Serial ATA (6Gb/s)	
	Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
	Buffer	32MB	
	Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	1ms
		Average	4.2ms
		Full Stroke	25ms (typical)
	Rotational Speed	7,200 rpm	
	Operating Temperature	32° to 140° F (0° to 60° C)	

Technical Specifications - Hard Drives

HP Solid State Drives (SSDs) for Workstations	**HP 128GB SATA 6Gb/s SSD**	**Capacity**	128GB	
		Height	0.28 in; 0.7 cm	
		Width	**Physical Size**	2.5 in; 6.36 cm
		Interface	SATA 6Gb/s	
		Synchronous Transfer Rate (Maximum)	Up to 500MB/s (Sequential Read)	
		Operating Temperature	32° to 158° F (0° to 70° C)	
	HP 256GB SATA 6Gb/s SSD	**Capacity**	256GB	
		Height	0.28 in; 0.7 cm	
		Interface	SATA 6Gb/s	
		Synchronous Transfer Rate (Maximum)	Up to 500MB/s (Sequential Read)	
		Operating Temperature	32° to 158° F (0° to 70° C)	
	HP 256GB SATA 6Gb/s SED SSD	**Capacity**	256GB	
		Height	0.28 in; 0.7 cm	
		Width	**Physical Size**	2.5 in; 6.36 cm
		Interface	6Gb/s SATA	
		Synchronous Transfer Rate (Maximum)	Up to 500MB/s (Sequential Read)	
		Operating Temperature	32° to 158° F (0° to 70° C)	
	HP 512GB SATA 6Gb/s SSD	**Capacity**	512GB	
		Height	0.28 in; 0.7 cm	
		Width	**Physical Size**	2.5 in; 6.36 cm
		Interface	6Gb/s SATA	
		Synchronous Transfer Rate (Maximum)	Up to 500MB/s (Sequential Read)	
		Operating Temperature	32° to 158° F (0° to 70° C)	
	Seagate 600 Pro 120GB SATA SSD	**Capacity**	120GB	
		Height	0.276 in; 0.7 cm	
		Width	**Physical Size**	2.76 in; 7.01 cm
		Interface	SATA 6Gb/s	
		Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
		Operating Temperature	32° to 158° F (0° to 70° C)	

Technical Specifications - Hard Drives

	Seagate 600 Pro 240GB SATA SSD	**Capacity**	240GB	
		Height	0.28 in; 0.7 cm	
		Width	**Physical Size**	2.76 in; 7.01 cm
		Interface	SATA 6Gb/s	
		Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
		Operating Temperature	32° to 158° F (0° to 70° C)	
	Seagate 600 Pro 480GB SATA SSD	**Capacity**	480GB	
		Height	0.28 in; 0.7 cm	
		Width	**Physical Size**	2.76 in; 7.01 cm
		Interface	SATA 6Gb/s	
		Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
		Operating Temperature	32° to 158° F (0° to 70° C)	
	Intel Pro 1500 180GB SATA SSD	**Capacity**	180GB	
		Width	**Physical Size**	2.5 in; 6.36 cm
		Interface	6Gb/s SATA	
		Synchronous Transfer Rate (Maximum)	600 Mb/s	
		Operating Temperature	32° to 158° F (0° to 70° C)	
PCIe SSDs for HP Workstations	**Fusion ioFX 410GB PCIe Accelerator**	**Capacity**	410GB	
		Interface	PCI Express 2.0 x4 electrical x4 physical	
		Operating Temperature	32° to 95° F (0° to 35° C)	

Technical Specifications - Hard Drive Controllers

LSI 9217-4i4e 8-port SAS 6Gb/s RAID Card	**PCI Bus**	8 lanes, PCI Express 3.0
	RAID Levels	Offers Integrated RAID (0, 1, 1E and 10)
	PCI Data Burst Transfer Rate	Half Duplex x8, PCIe, 8000 MB/s
	SAS Bandwidth	**Half Duplex** 600 MB/s per lane
	PCI Card Type	3.3V Add-in card
	PCI Voltage	12 V ± 10%
	PCI Power	9.8W typical, Airflow min 200 LFM
	Bracket	Full height and low profile
	Certification Level	PCI Express 3.0 compliant
	IO Bus	1x4 6Gb/s SAS ports
	SAS Processor	LSI SAS2308/ Fusion MPT 2.0
	Internal Connectors	One x4 internal mini-SAS (SFF8087)
	External Connectors	One x4 external mini-SAS (SFF8088)
	Maximum Number of SCSI Devices	256 Non-RAID SAS/SATA devices
	LED Indicators	N/A

LSI MegaRAID® 9260-8i SAS 6Gb/s ROC RAID Card and iBBU08 Battery Backup Unit	**PCI Bus**	PCI-Express (Gen2) V2.0 x8 lanes
	PCI Modes	Bus Master DMA
	RAID Levels	RAID 0, 1, 5, and 6 RAID spans 10, 50 and 60
	PCI Data Burst Transfer Rate	Up to 4GB/s
	PCI Card Type	Low profile, single PCIe slot design with full height bracket. The optional iBBU08 Battery Backup unit mounts on the controller card and the assembly remains within a single PCIe slot width.
	PCI Voltage	+3.3V Add-in Card
	PCI Power	12.5 Watts
	Certification Level	PCI-Express 2.0
	IO Bus	Eight 3 Gb/s and 6Gb/s compatible SAS/SATA ports
	Internal Connectors	Two SAS SFF8087 x4
	External Connectors	None
	Maximum Number of SCSI Devices	32. **NOTE:** HP Workstations do not support this many internal drives.
	LED Indicators	Connector LEDs indicate whether the internal connector is active for ports 0-3 and 4-7

Technical Specifications - Hard Drive Controllers

LSI 9270-8i SAS 6Gb/s ROC RAID Card and iBBU9 Battery Backup Unit	**PCI Bus**	x8 lane PCIe 3.0 compliant
	RAID Levels	RAID 0, 1, 5, and 6 RAID spans 10, 50 and 60
	PCI Card Type	Low profile, single PCIe slot design with full height bracket.
	PCI Voltage	+3.3V Add-in Card
	PCI Power	+3.3V, +12V
	Certification Level	PCI-Express 3.0
	IO Bus	Eight 6Gb/s and 3Gb/s compatible SAS/SATA ports
	SAS Processor	LSISAS2208 Dual-Core RAID on Chip (ROC)
	Internal Connectors	Two SAS SFF8087 x4 (Mini-SAS)
	External Connectors	None
	Maximum Number of SCSI Devices	Up to 128 SAS and/or SATA hard drives and SSDs **NOTE:** HP Workstations do not support this many internal drives.
	LED Indicators	Heartbeat LED on card

Technical Specifications - Graphics

NVIDIA NVS 310 512MB Graphics	**Form Factor**	Low Profile: 2.713 inches in height × 6.150 inches in length Weight: ~142 grams
	Graphics Controller	NVIDIA NVS 310 GPU: GF119-825
	Bus Type	PCI Express x16, 2.0 compliant
	Memory	Size: 512MB DDR3 Clock: 875Mhz Memory Bandwidth: 14GB/s
	Connectors	2 x DisplayPort
	Maximum Resolution	Up to 2560 x 1600 (digital display) per display.
	Image Quality Features	The following video formats are supported: - MPEG2 - MPEG4 Part 2 Advanced Simple Profile - H.264 SVC codec support - Support for 3D Blu Ray - VC1 - DivX version 3.11 and later - MVC A full range of video resolutions are supported including 1080p, 1080i, 720p, 480p and 480i. The NVS 310 GPU provides hardware acceleration for the computationally intensive parts of video processing, as well as provides improved video playback speeds via faster decode and transcode.
	Display Output	Up to 2 displays in the following configurations: DisplayPort output: ● Drives two DisplayPort enabled digital display at resolutions up to 2560 × 1600 at 60 Hz with reduced blanking, when connected natively using the 2 DisplayPort connectors on the NVS 310 graphics card ● Supports 2 monitors up to resolution of 1920 × 1200 at 60 Hz with reduced blanking using DisplayPort 1.2 multi stream topology technology. DVI-D output: ● Drives two digital display at resolutions up to 1920 × 1200 at 60 Hz with reduced blanking using DisplayPort to DVI-D single-link cable adaptors ● Drives two digital display at resolutions up to 2560× 1600 at 60 Hz with reduced blanking using DisplayPort to DVI-D dual-link cable adaptors HDMI output: ● NVS 310 is capable of driving two high definition (HD) panels up to resolutions of 1920 × 1080P at 60 Hz using DisplayPort to HDMI cable adaptors VGA display output:

		• Drives two analog display at resolutions up to 1920 × 1200 at 60 Hz using DisplayPort to VGA cable adaptors
	Shading Architecture	Shader Model 5.0
	Supported Graphics APIs	DX11, OpenGL 4.1
	Available Graphics Drivers	Windows 8 Genuine Windows 7 Professional (64-bit and 32-bit) Microsoft Windows XP Professional (64-bit and 32-bit) Red Hat Enterprise Linux(RHEL) SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit) HP qualified drivers may be preloaded or the latest HP qualified drivers are available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html SUSE Linux Enterprise drivers may also be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com
	Power Consumption	19.5 Watts
	Note	1. The thermal solution used on this card is an active fan heatsink. 2. Factory configured NVS 310 graphics card have no cable adpaters included. Adapters must be ordered separately. 3. Option kit NVS 310 includes 2 DP to DVI-D cable adapters.
NVIDIA NVS 510 2GB Graphics	**Form Factor**	Low Profile, 2.713 inches × 6.3 inches, single slot
	Graphics Controller	NVS 510 GPU Core Clock: 797 Mhz Memory Clock: 891 Mhz CUDA Cores: 192
	Bus Type	PCI Express x16, Generation 2.0
	Memory	2GB DDR3
	Connectors	Four mini-DisplayPort. Four mini-DisplayPort to DisplayPort adapters included. (DisplayPort to DVI-D, DisplayPort to VGA, DisplayPort to HDMI, and DisplayPort to Dual-Link DVI adapters available as separate accessories)
	Maximum Resolution	Mini-DisplayPort connectors support ultra-high-resolution panels (up to 3840 x 2160 @ 60Hz) **NOTE:** This card supports up to four displays. For Windows XP, only 2 active displays are supported.
	Image Quality Features	10-bit internal display processing, including hardware support for 10-bit scan-out
	Display Output	DisplayPort with Multi-Stream Technology (MST) and High Bit Rate 2 (HBR2) support. Digital Display Support 1. DisplayPort Output - Drives four DisplayPort enabled digital display at resolutions up to 3840 ×

		2160 at 60 Hz with reduced blanking, when connected natively using the 4 DisplayPort connectors on the NVS 510 graphics card. - DisplayPort Multi-Stream Topology (MST) Technology: Supports various combinations of display resolutions and number of displays when using DisplayPort multi stream topology technology - up to a maximum of 4 monitors at a resolution of 1920 × 1200 at 60 Hz with reduced blanking. 2. DVI-D Output - Drives four digital displays at resolutions up to 1920 × 1200 at 60 Hz with reduced blanking using DisplayPort to DVI-D single-link cable adaptors. - Drives four digital displays at resolutions up to 2560× 1600 at 60 Hz with reduced blanking using DisplayPort to DVI-D dual-link cable adaptors. 3. HDMI Output - The NVS 510 graphics board is capable of driving four high definition (HD) panels up to resolutions of 1920 × 1080P at 60 Hz using DisplayPort to HDMI cable adaptors. Analog Display Support 1. VGA display output - Drives four analog displays at resolutions up to 1920 × 1200 at 60 Hz using DisplayPort to VGA cable adaptors.
	Supported Graphics APIs	Full Microsoft DirectX 11, Shader Model 5.0 support Full OpenGL 4.3 support
	Available Graphics Drivers	Genuine Windows 7 Professional (64-bit and 32-bit) Microsoft Windows XP Professional (64-bit and 32-bit) Red Hat Enterprise Linux(RHEL) 6 Desktop/Workstation SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit) HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html
	Power Consumption	33.4 Watts
	Note	Heatsink cooler design is active.
NVIDIA NVS 315 1GB Graphics (for HP Workstations)	**Form Factor**	Low Profile: 2.713 inches in height × 5.7 inches in length Weight: ~142 grams
	Graphics Controller	NVIDIA NVS 315 (using GF119-825 GPU) Number of Cores: 48 CUDA cores Max. Power: 19.3W Cooling Solution: Active fan heatsink
	Bus Type	PCI Express x16, 2.0 compliant
	Memory	Size: 1GB DDR3 Clock: 875Mhz Memory Bandwidth: 14GB/s

Technical Specifications - Graphics

Connectors	DMS-59 output Cables included: - For CTO: DMS-59 to DVI cable - For AMO: DMS-59 to DVI cable and DMS-59 to VGA cable
Maximum Resolution	Maximum number of displays supported: 2 Maximum Resolution Support: - DMS-59 to VGA: 2048 x 1536 @ 85Hz - DMS-59 to DVI: 1980 x 1200 @ 60Hz - DMS-59 to DP: 2560 x 1600 @ 60Hz
Image Quality Features	See Display Output section. The following video formats are supported: - MPEG2 - MPEG4 Part 2 Advanced Simple Profile - H.264 SVC codec support - Support for 3D Blu Ray - VC1 - DivX version 3.11 or later A full range of video resolutions are supported including 1080p, 1080i, 720p, 480p and 480i. The NVS 315 GPU provides hardware acceleration for the computationally intensive parts of video processing, as well as provides improved video playback speeds via faster decode and transcode.
Display Output	Up to 2 displays using one of the following DMS-59 cables: DMS-59 to DVI DMS-59 to VGA DMS-59 to DP DisplayPort output: - Drives two DisplayPort enabled digital displays at resolutions up to 2560 × 1600 at 60 Hz with reduced blanking, when connected via the DMS-59 to DP adapter. DVI-D output: - Drives two digital display at resolutions up to 1920 × 1200 at 60 Hz with reduced blanking using DMS-59 to DVI-D single-link cable adaptor VGA display output: - Drives two analog display at resolutions up to 2048 × 1536 at 85 Hz using DMS-59 to VGA cable adaptor.
Shading Architecture	Shader Model 5.0
Supported Graphics APIs	DX11, OpenGL 4.3
Available Graphics Drivers	Windows 8 Microsoft Windows 7 Professional (64-bit and 32-bit) Microsoft Windows XP Professional (64-bit and 32-bit) Red Hat Enterprise Linux(RHEL) SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit)

		HP qualified drivers may be preloaded or the latest HP qualified drivers are available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html SUSE Linux Enterprise drivers may also be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com
	Notes	1. The thermal solution used on this card is an active fan heatsink. 2. Factory configured graphics card includes DMS-59 to DVI cable. 3. Option kit graphics card includes DMS-59 to DVI and DMS-59 to VGA cables (one each).

NVIDIA Quadro 410 512MB Graphics	**Form Factor**	Low Profile: 2.713 inches × 5.7 inches, single slot
	Graphics Controller	NVIDIA Quadro 410 GPU: GK107
	Bus Type	PCI Express x16, 3.0 compliant
	Memory	Size: 512MB DDR3 Clock: 900MHz Memory Bandwidth: 14GB/s
	Connectors	One dual-link DVI-I connector One DisplayPort connector
	Maximum Resolution	VGA (through DVI to VGA cable): • 2048 × 1536 × 32 bpp at 85 Hz Dual-link DVI • 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking) Single-link DVI • 1920 × 1200 × 32 bpp at 60 Hz (reduced blanking) DisplayPort 1.2 • 3840 × 2160 × 36 bpp at 60 Hz
	RAMDAC	400 MHz integrated RAMDAC
	Display Output	Maximum number of displays supported: 2
	Shading Architecture	Shader Model 5.0
	Supported Graphics APIs	DX11, OpenGL 4.2
	Available Graphics Drivers	Windows 8 Genuine Windows 7 Professional (64-bit and 32-bit) Microsoft Windows XP Professional (64-bit and 32-bit) Red Hat Enterprise Linux(RHEL) SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit) HP qualified drivers may be preloaded or the latest HP qualified drivers are available from the HP support Web site:

		http://welcome.hp.com/country/us/en/support.html SUSE Linux Enterprise drivers may also be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com
	Notes	1. Factory configured Quadro 410 does not include any video adapters. Adapters must be ordered separately. 2. Option kit Quadro 410 includes one DP to DVI-D adapter
NVIDIA Quadro K600 1GB Graphics	**Form Factor**	2.731" H x 6.3" L Single Slot, Low Profile Full Height Profile bracket installed Low Profile bracket included
	Graphics Controller	NVIDIA Quadro K600 Graphics Card Kepler GK107 GPU 192 CUDA cores Max Power: 41 Watts
	Bus Type	PCI Express 2.0 x16
	Memory	1 GB GDDR3, 891 Mhz 128-bit memory I/O path 29 GB/s memory bandwidth
	Connectors	1 DL-DVI(I) output, 1 DisplayPort output CTO: No video cable adapter included AMO: One DP-to-DVI adapter included with card Additional DVI-to-VGA, DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as accessories
	Maximum Resolution	DisplayPort: - up to 3840 x 2160 x 30 bpp @ 60Hz - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST) DL-DVI(I) output: - up to 2560 x 1600 x 32 bpp @ 60Hz
	Image Quality Features	10-bit internal display processing pipeline 10-bit scan-out support
	Display Output	VGA: - requires use of DVI-to-VGA and/or DP-to-VGA video cable adapters - 400 Mhz integrated RAMDAC - Max resolution: 2048 x 1536 x 32 bpp @ 85 Hz DL-DVI(I): - Max resolution: 2560 x 1600 x 32 bpp @ 60 Hz SL-DVI(I): - Max resolution: 1920 x 1200 x 32 bpp @ 60 Hz DisplayPort: - Supports HBR2 and MST - Max resolution: 3840 x 2160 x 30 bpp @ 60 Hz (only one monitor can be connected to the Quadro K600 DisplayPort connector at this resolution)

Technical Specifications - Graphics

		- Max number of daisy-chained monitors: 2
	Shading Architecture	Full Microsoft DirectX 11 Shader Model 5.0
	Supported Graphics APIs	OpenGL 4.3 DirectX 11 API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran
	Available Graphics Drivers	Windows 8 Pro 64-bit Windows 8 (China) 64-bit Genuine Windows 7 Professional (64-bit and 32-bit) Red Hat Enterprise Linux (RHEL) 5 Desktop/Workstation (64-bit) Red Hat Enterprise Linux(RHEL) 6 Desktop/Workstation SUSE Linux Enterprise Desktop 11 (64-bit) HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html SUSE Linux Enterprise drivers may also be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com
	Notes	1. Quadro K600 offered as CTO does not include a video cable adapter. Video cable adapters must be ordered separately. 2. Quadro K600 offered as AMO includes one DP-to-DVI video cable adapter. Additonal cables must be ordered separately. 3. Quadro K600 is Windows 8 Compliant. 4. A total maximum of 2 active monitors are supported across all display output types.
AMD FirePro V3900 1GB Graphics	**Form Factor**	Full height, half length (full-height bracket included)
	Graphics Controller	AMD FirePro™ V3900 professional graphics
	Bus Type	PCI Express® x16, Generation 2.1
	Memory	1GB DDR3 memory
	Connectors	1 DL DVI, 1 DP output One DP to DVI adapter included
	Maximum Resolution	2560x1600 per display (5120x1600 max. horizontal resolution)
	Display Output	1 DisplayPort® 1.2 1 Dual-link DVI
	Supported Graphics APIs	OpenCL™ 1.1, DirectX® 11 and OpenGL 4.2
	Available Graphics Drivers	Genuine Windows® 7 Professional (64-bit and 32-bit) Genuine Windows Vista® Business (64-bit and 32-bit) Microsoft® Windows XP® Professional (64-bit and 32-bit) Red Hat Enterprise Linux(RHEL) SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit) HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html
	Power Consumption	<50W

Technical Specifications - Graphics

	Note	AMD Eyefinity technology can support multiple displays using a single enabled AMD FirePro™ professional graphics card; the number of supported displays varies by card model. Microsoft® Windows® 7, Windows Vista®, or Linux® is required in order to support more than 2 displays. Depending on the card model, native DisplayPort™ connectors and/or certified DisplayPort™ active or passive adapters to convert your monitor's native input to your card's DisplayPort™ or Mini-DisplayPort™ connector(s) may be required. See www.amd.com/firepro for details.
NVIDIA Quadro K2000 2GB Graphics	**Form Factor**	4.38" H x 7.97" L Single Slot, Full Height
	Graphics Controller	NVIDIA Quadro K2000 Graphics Card Kepler GK107 GPU 384 CUDA cores Max Power: 51.1 Watts
	Bus Type	PCI Express 2.0 x16
	Memory	2 GB GDDR5, 2000 Mhz 128-bit memory I/O path 64 GB/s memory bandwidth
	Connectors	1 DL-DVI(I) output, 2 DisplayPort outputs CTO: No video cable adapter included AMO: One DP-to-DVI adapter included with card Additional DVI-to-VGA, DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as accessories
	Maximum Resolution	DisplayPort: - up to 3840 x 2160 x 30 bpp @ 60Hz - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST) DL-DVI(I) output: - up to 2560 x 1600 x 32 bpp @ 60Hz
	Image Quality Features	• 10-bit internal display processing pipeline • 10-bit scan-out support
	Display Output	VGA: - requires use of DVI-to-VGA and/or DP-to-VGA video cable adapters - 400 Mhz integrated RAMDAC - Max resolution: 2048 x 1536 x 32 bpp @ 85 Hz DL-DVI(I): - Max resolution: 2560 x 1600 x 32 bpp @ 60 Hz SL-DVI(I): - Max resolution: 1920 x 1200 x 32 bpp @ 60 Hz DisplayPort: - Supports HBR2 and MST - Max resolution: 3840 x 2160 x 30 bpp @ 60 Hz (only one monitor can be connected to a Quadro K2000 DisplayPort connector at this resolution) - Max number of DisplayPort daisy-chained monitors or hub connected

		monitors from a single Quadro K2000 DisplayPort connector: 4 with maximum resolution of 1920 x 1200 Maximum number of monitors across all available Quadro K2000 outputs is 4.
	Shading Architecture	Full Microsoft DirectX 11 Shader Model 5
	Supported Graphics APIs	OpenGL 4.3 DirectX 11 API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran
	Available Graphics Drivers	Windows 8 Pro 64-bit Windows 8 (China) 64-bit Genuine Windows 7 Professional (64-bit and 32-bit) Red Hat Enterprise Linux (RHEL) 5 Desktop/Workstation (64-bit) Red Hat Enterprise Linux(RHEL) 6 Desktop/Workstation SUSE Linux Enterprise Desktop 11 (64-bit) HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html SUSE Linux Enterprise drivers may also be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com
	Notes	1. Quadro K2000 offered as CTO does not include a video cable adapter. Video cable adapters must be ordered separately. 2. Quadro K2000 offered as AMO includes one DP-to-DVI video cable adapter. Additional cables must be ordered separately.
AMD FirePro W7000 4GB Graphics	**Form Factor**	Full height, full length, single slot
	Graphics Controller	AMD FirePro™ W7000 Professional Graphics Max Power: <150 Watts
	Bus Type	PCI Express™ x16, Generation 3.0
	Memory	4GB GDDR5, 153.6 GB/s bandwidth, ECC support
	Connectors	4 x DisplayPort with HBR2 and MST support.
	Maximum Resolution	DisplayPort: 4096x2160 @24bpp 60Hz Dual Link DVI: 2560x1600 (requires DP to DL-DVI adapter) Single Link DVI: 1920x1200 (requires DP to DVI adapter) VGA: 1920x1200 (requires DP to VGA adapter)
	Image Quality Features	Advanced support for 8-bit, 10-bit, and 16-bit per RGB color component
	Display Output	Max number of monitors supported using DisplayPort: 6 Monitor chaining from a single DisplayPort options(subject to a max of 6 total monitors across all outputs, requires use of DisplayPort Monitors supporting MST or the use of DisplayPort hubs): ● 1 4096x2169 display ● 2 2560x1600 displays ● 4 1920x1200 displays

Technical Specifications - Graphics

	Shading Architecture	Shader Model 5.0
	Supported Graphics APIs	OpenGL® 4.2 with OpenGL Shading Language OpenCL 1.1 Microsoft® DirectX® 11.1
	Available Graphics Drivers	Windows 8 Windows 7 Professional (64-bit and 32-bit) Windows 8 (64bit and 32-bit) Red Hat Enterprise Linux(RHEL) SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit) HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html
	Note	1. AMD Eyefinity technology can support multiple displays using a single enabled AMD FirePro™ professional graphics card; the number of supported displays varies by card model. Microsoft® Windows® 7, Windows Vista®, or Linux® is required in order to support more than 2 displays. Depending on the card model, native DisplayPort™ connectors and/or certified DisplayPort™ active or passive adapters to convert your monitor's native input to your card's DisplayPort™ or Mini-DisplayPort™ connector(s) may be required. See www.amd.com/firepro for details. 2. Factory configured FirePro W7000 graphics card does not include any video adapter cables. Adapters must be ordered separately. 3. Option Kit FirePro W7000 graphics card does not include any video cable adapters. Adapters must be ordered seperately.
NVIDIA Quadro K4000 3GB Graphics	**Form Factor**	4.376" H x 9.5" L Single Slot, Full Height
	Graphics Controller	NVIDIA Quadro K4000 Graphics Card Kepler GK106 GPU 768 CUDA cores Max Power: 80 Watts
	Bus Type	PCI Express 2.0 x16
	Memory	3 GB GDDR5, 2800 Mhz 192-bit memory I/O path 134 GB/s memory bandwidth
	Connectors	1 DL-DVI(I) output, 2 DisplayPort outputs CTO: No video cable adapter included AMO: One DP-to-DVI adapter included with card Additional DVI-to-VGA, DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as accessories

Technical Specifications - Graphics

Maximum Resolution	DisplayPort: - up to 3840 x 2160 x 30 bpp @ 60Hz - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST) DL-DVI(I) output: - up to 2560 x 1600 x 32 bpp @ 60Hz
Image Quality Features	• 10-bit internal display processing pipeline • 10-bit scan-out support
Display Output	VGA: - requires use of DVI-to-VGA and/or DP-to-VGA video cable adapters - 400 Mhz integrated RAMDAC - Max resolution: 2048 x 1536 x 32 bpp @ 85 Hz DL-DVI(I): - Max resolution: 2560 x 1600 x 32 bpp @ 60 Hz SL-DVI(I): - Max resolution: 1920 x 1200 x 32 bpp @ 60 Hz DisplayPort: - Supports HBR2 and MST - Max resolution: 3840 x 2160 x 30 bpp @ 60 Hz (only one monitor can be connected to a Quadro K4000 DisplayPort connector at this resolution) - Max number of DisplayPort daisy-chained monitors or hub connected monitors from a single Quadro K4000 DisplayPort connector: 4 with maximum resolution of 1920 x 1200 HDMI: - Requires use of DP-to-HDMI cable - Max Resolution: 1920 x 1080 x 32 bpp @ 60Hz Maximum number of monitors across all available Quadro K4000 outputs is 4.
Shading Architecture	Full Microsoft DirectX 11 Shader Model 5.0
Supported Graphics APIs	OpenGL 4.3 DirectX 11 API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran
Available Graphics Drivers	Windows 8 Pro 64-bit Windows 8 (China) 64-bit Genuine Windows 7 Professional (64-bit and 32-bit) Red Hat Enterprise Linux (RHEL) 5 Desktop/Workstation (64-bit) Red Hat Enterprise Linux(RHEL) 6 Desktop/Workstation SUSE Linux Enterprise Desktop 11 (64-bit) HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html SUSE Linux Enterprise drivers may also be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com

Technical Specifications - Graphics

	Notes	1. Quadro K4000 offered as CTO does not include a video cable adapter. Video cable adapters must be ordered separately. 2. Quadro K4000 offered as AMO includes one DP-to-DVI video cable adapter. Additional cables must be ordered separately. 3. Quadro K4000 is Windows 8 Compliant. 4. A total maximum of 4 active monitors are supported across all display output types. To get 4 monitors, at least one monitor must be daisy chained on a DisplayPort output. 5. A DisplayPort hub device may be used to connect multiple DisplayPort monitors to a single Quadro K4000 DisplayPort output.
NVIDIA Quadro K5000 4GB Graphics	**Form Factor**	4.376" H x 10.5" L Dual Slot
	Graphics Controller	NVIDIA Quadro K5000 Graphics Card based on the GK104 GPU
	Bus Type	PCI Express 2.0 x16
	Memory	4GB GDDR5 173GB/s memory bandwidth
	Connectors	DVI-I (1), DVI-D (1), DP (2), Optional 3D Stereo bracket with 3-pin mini-DIN connector. No adapter included with card. DVI to VGA, DisplayPort to VGA, DisplayPort to DVI, and DisplayPort to Dual-Link DVI adapters available as accessories
	Image Quality Features	• DisplayPort with Multi-Stream Technology (MST) and High Bit Rate 2 (HBR2), HDMI 1.4, and HDCP support • NVIDIA 3D Vision™ technology
	Display Output	400 MHz integrated RAMDAC • Maximum resolution over VGA (through DVI to VGA cable): 2048 × 1536 × 32 bpp at 85 Hz Dual-link internal TMDS (DVI 1.0) • Maximum resolution over digital port (single GPU and SLI mode): 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking) Single-link internal TMDS (DVI 1.0) • Maximum resolution over digital port (single GPU and SLI mode):1920 × 1200 × 32 bpp at 60 Hz (reduced blanking) DisplayPort with MST and HBR2. • Maximum resolution: 3840 × 2160 × 36 bpp at 60Hz HDMI • Maximum resolution: 1920 × 1080 × 32 bpp at 60Hz

Technical Specifications - Graphics

	Supported Graphics APIs	OpenGL 4.2 DirectX 11 Shader model 5.0 Support API support for NVIDIA's CUDA™ C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, Fortran
	Available Graphics Drivers	Genuine Windows 7 Professional (64-bit and 32-bit) Genuine Windows Vista Business (64-bit and 32-bit) Microsoft Windows XP Professional (64-bit and 32-bit) Red Hat Enterprise Linux (RHEL) 5 Desktop/Workstation (64-bit and 32-bit) Red Hat Enterprise Linux (RHEL) 6 Desktop/Workstation SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit) HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html
	Power Consumption	122 Watts
	Note	No display output adapter included.
NVIDIA Quadro 6000 6GB Graphics	**Form Factor**	4.376" H x 9.75" L Dual Slot
	Graphics Controller	NVIDIA Quadro 6000 Graphics Card
	Bus Type	PCI Express 2.0 x16
	Memory	6 GB GDDR5 384-bit ECC Memory
	Connectors	1 DVI-I output, 2 DisplayPort outputs, 1 Stereo(3-pin mini DIN); One DP to DVI adapter included with card DVI to VGA, DisplayPort to VGA and DisplayPort to dual link DVI adapters available as accessories
	Maximum Resolution	Dual DisplayPort (up to 2560 x 1600 @ 60Hz and 1920x1200 @ 120Hz) Dual-link DVI-I output (up to 2560 x 1600 @ 60Hz and 1920x1200 @ 120Hz)
	Image Quality Features	• 30-bit color • Up to 16K x16K texture and render processing • Transparent multisampling and super sampling • 16x angle independent anisotropic filtering • 128-bit floating point performance • 32-bit per-component floating point texture filtering and blending • 64x full scene antialiasing (FSAA) / 128x FSAA in SLI Mode • Support for any combination of two connected displays • DisplayPort 1.1a, HDMI 1.3a, and HDCP support • NVIDIA 3D Vision™ technology, 3D DLP, Interleaved, and other 3D stereo format support • Full OpenGL quad buffered stereo support • Underscan/overscan compensation and hardware scaling • NVIDIA nView® multi-display technology
	Shading Architecture	Shader Model 5.0

Technical Specifications - Graphics

Supported Graphics APIs	OpenGL 4.0 DirectX 11 CUDA API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran
Available Graphics Drivers	Genuine Windows 7 Professional (64-bit and 32-bit) Genuine Windows Vista Business (64-bit and 32-bit) Microsoft Windows XP Professional (64-bit and 32-bit) Red Hat Enterprise Linux (RHEL) 5 Desktop/Workstation (64-bit and 32-bit) Red Hat Enterprise Linux (RHEL) 6 Desktop/Workstation SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit) HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html Novell SUSE Linux Enterprise drivers may also be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com
Power Consumption	<250 Watts

Technical Specifications - High Performance GPU Computing

NVIDIA Tesla K20c Compute Processor	**Form Factor**	4.376 inches by 10.5 inches Dual Slot
	System Interface	PCI Express Gen2 ×16
	Video Outputs	None.
	Memory	5GB GDDR5, 320-bit memory path
	Peak Memory Bandwidth	208 GB/s (with ECC off)
	Supported APIs	CUDA and OpenACC API support includes: CUDA C, CUDA C++, Java, Python, and Fortran
	Supported Operating Systems	Windows 8 (64-bit) Genuine Windows 7 Professional (64-bit) Red Hat Enterprise Linux (RHEL) 5, 6 Desktop/Workstation (64-bit) SUSE Linux Enterprise Desktop 11 (64-bit) HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html Novell SUSE Linux Enterprise drivers may also be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com
	Processor Cores	GK110 GPU, 706 MHz clock 2496 CUDA cores
	Power Consumption	~225 Watts **NOTE 1:** A 1125W PSU is required for any K20 configuration on the Z820

Technical Specifications - Multimedia and Audio Devices

HP Thin USB Powered Speakers	**Frequency Response** (-3dB, 24-bit/96kHz input)	FO to 20kHz
	Dimensions	Speakers: 14.52 x 9.50 x 2.45 cm (5.72 x 3.74 x 0.96 in) per speaker

Technical Specifications - Optical and Removable Storage

HP DVD-ROM Drive	**Description**		5.25-inch, half-height, tray-load
	Mounting Orientation		Either horizontal or vertical
	Interface Type		SATA/ATAPI
	Dimensions (WxHxD)		15.0 x 4.4 x 20.3 cm (5.9 x 1.7 x 8.0 in)
	Disc Capacity	**DVD-ROM**	Single layer: Up to 4.7 GB Double layer: Up to 8.5 GB
	Access Times	**DVD-ROM Single Layer**	< 140 ms (typical)
		CD-ROM Mode 1	< 125 ms (typical)
		Full Stroke DVD	< 250 ms (seek)
		Full Stroke CD	< 210 ms (seek)
	Power	**Source**	SATA DC power receptacle
		DC Power Requirements	5 VDC ± 5%-100 mV ripple p-p 12 VDC ± 5%-200 mV ripple p-p
		DC Current	5 VDC - <1000 mA typical, < 1600 mA maximum 12 VDC - < 600 mA typical, < 1400 mA maximum
	Operating Environmental (all conditions non-condensing)	**Temperature**	41° to 122° F (5° to 50° C)
		Relative Humidity	10% to 90%
		Maximum Wet Bulb Temperature	86° F (30° C)
		Operating Systems Supported	Windows 7 Professional 32-bit and 64-bit, Windows Vista Business 64*, Windows Vista Business 32*, Windows Vista Home Basic 32*, Windows 2000, Windows XP Professional or Windows XP Home 32*. Red Hat Enterprise Linux(RHEL) WS4**, 5, 6 Desktop/Workstation, Removed reference to "Novell" because of acquisition and changed product reference to "SUSE Linux Enterprise Desktop 10 & 11", No driver is required for this device. Native support is provided by the operating system.

HP DVD+/-RW Drive	**Description**	5.25-inch, half-height, tray-load
	Mounting Orientation	Either horizontal or vertical
	Interface Type	SATA/ATAPI
	Dimensions (WxHxD)	15.0 x 4.4 x 17.5 cm (5.9 x 1.7 x 8.0 in)
	Disc Formats	DVD-RAM DVD+R DVD+RW DVD+R DL DVD-R DL DVD-R DVD-RW

Technical Specifications - Optical and Removable Storage

		CD-R CD-RW	
Disc Capacity	**DVD-ROM**	8.5 GB DL or 4.7 GB standard	
	Full Stroke DVD	< 240 ms (seek)	
	Full Stroke CD	< 200 ms (seek)	
Maximum Data Transfer Rates	**CD ROM Read**	CD-ROM, CD-R Up to 40X CD-RW Up to 32X	
	DVD ROM Read	DVD-RAM	Up to 12X
		DVD+RW	Up to 8X
		DVD-RW	Up to 8X
		DVD+R DL	Up to 12X
		DVD-R DL	Up to 12X
		DVD-ROM	Up to 16X
		DVD-ROM DL	Up to 12X
		DVD+R	Up to 16X
		DVD-R	Up to 16X
Power	**Source**	SATA DC power receptacle	
	DC Power Requirements	5 VDC ± 5%-100 mV ripple p-p 12 VDC ± 5%-200 mV ripple p-p	
	DC Current	5 VDC -<1000 mA typical, <1600 mA maximum 12 VDC -<1200 mA typical, <2000 mA maximum	
Operating Environmental (all conditions non-condensing)	**Temperature**	41° to 122° F (5° to 50° C)	
	Relative Humidity	10% to 90%	
	Maximum Wet Bulb Temperature	86° F (30° C)	
	Operating Systems Supported	Windows 8 32-bit and 64-bit, Windows 7 Professional 32-bit and 64-bit, Windows Vista Business 64*, Windows Vista Business 32*, Windows Vista Home Basic 32*, Windows 2000, Windows XP Professional or Windows XP Home 32*. Red Hat Enterprise Linux(RHEL) WS4**, 5, 6 Desktop/Workstation SUSE Linux Enterprise Desktop 10 & 11 No driver is required for this device. Native support is provided by the operating system.	
	Kit Contents	HP SATA SuperMulti DVD Writer Drive, Roxio Easy Media Creator software, Intervideo WinDVD Software, installation guide, and DVD+R media.	

HP Blu-Ray Writer	**Description**	5.25-inch, half-height, tray-load
	Mounting Orientation	Either horizontal or vertical
	Interface Type	SATA

Technical Specifications - Optical and Removable Storage

Dimensions (WxHxD)	15.0 x 4.4 x 20.3 cm (5.9 x 1.7 x 8.0 in)		
Disc Formats	BD-ROM BD-R BD-RE DVD-RAM DVD+R DVD+RW DVD+R DL DVD-R DL DVD-R DVD-RW CD-R CD-RW		
Disc Capacity	**DVD-ROM**	8.5 GB DL or 4.7 GB standard	
	Blu-ray	50 GB DL or 25 GB standard	
	Full Stroke DVD	< 250 ms (seek)	
	Full Stroke CD	< 210 ms (seek)	
	Blu-ray	Blu-ray	
	Startup Time (Time to drive ready from tray loading)	BD-ROM (SL/DL)	25S / 28S
		BD-R (SL/DL)	25S / 28S
		BD-RE (SL/DL)	25S / 28S
		DVD-ROM (SL/DL)	18S / 18S
		DVD-R (SL/DL)	25S / 25S
		DVD-RW	25S
		DVD+R (SL/DL)	25S / 25S
		DVD+RW	25S
		DVD-RAM	45S
		CD-ROM	45S
Maximum Data Transfer Rates	**CD ROM Read**	CD-ROM	Up to 40X
		CD-R	Up to 40X
		CD-RW	Up to 40X
	DVD ROM Read	DVD-RAM	Up to 5X
		DVD+RW	Up to 10X
		DVD-RW	Up to 10X
		DVD+R DL	Up to 8X
		DVD-R DL	Up to 8X
		DVD-ROM	Up to 16X
		DVD-ROM DL	Up to 8X
		DVD+R	Up to 12X
		DVD-R	Up to 12X
	Blu-Ray	BD-ROM	Up to 6X
		BD-ROM DL	Up to 4.8X
		BD-R	Up to 6X

		BD-R DL	Up to 4.8X
		BD-R	Up to 6X
		BD-RE SL/DL	Up to 4.8X
Power	**Source**	SATA DC power receptacle	
	DC Power Requirements	5 VDC ± 5%-100 mV ripple p-p 12 VDC ± 10%-100 mV ripple p-p	
	DC Current	5 VDC -900 mA typical, 1200 mA maximum 12 VDC -1000 mA typical, 1600 mA maximum	
Operating Environmental (all conditions non-condensing)	**Temperature**	41° to 122° F (5° to 50° C)	
	Relative Humidity	15% to 80%	
	Maximum Wet Bulb Temperature	86° F (30° C)	
	Operating Systems Supported	Windows 7 Professional 32-bit and 64-bit, Windows Vista Business 64*, Windows Vista Business 32*, Windows Vista Home Basic 32*, Windows 2000, Windows XP Professional or Windows XP Home 32*. Red Hat Enterprise Linux(RHEL) WS4**, 5, 6 Desktop/Workstation, SUSE Linux Enterprise Desktop 10 & 11 * No driver is required for this device. Native support is provided by the operating system. ** RHEL WS4 not supported on Z200/Z200SFF	
	Kit Contents	HP Blue Laser RW Drive, Roxio Easy Media Creator software, Intervideo WinDVD Software, installation guide.	
Disclaimer	As Blu-Ray is a new format containing new technologies, certain disc, digital connection, compatibility and/or performance issues may arise, and do not constitute defects in the product. Flawless playback on all systems is not guaranteed. In order for some Blu-Ray titles to play, they may require a DVI or HDMI digital connection and your display may require HDCP support. HD-DVD movies cannot be played on this workstation.		

HP 14-in-1 Media Card Reader	**Description**	Supports hardware ECC (Error Correction Code) function Supports hardware CRC (Cyclic Redundancy Check) function Supports MS 4-bit parallel transfer mode Supports MS-PRO 4-bit parallel transfer mode Supports MS PRO-HG Duo 4-bit parallel transfer mode Supports SD 4-bit parallel transfer mode Supports UHS-104 SD 4-bit card (version 3.0) Supports CF v6.0 with PIO mode 6 and Ultra DMA 7 mode
	Interface Type	USB 3.0 High-speed interface Note: If there is a USB2 connection, USB2 transfer speeds are supported.
	Dimensions (WxHxD)	4.9 x 4 x 1 in (124.5 x 101.6 x 25.4 mm)

Technical Specifications - Optical and Removable Storage

Supported Media Types	CompactFlash Type I CompactFlash Type II Microdrive Secure Digital Card (SD) Secure Digital High Capacity (SDHC) SD Extended Capacity Memory Card (SDXC) Memory Stick Memory Stick Select Memory Stick Duo (MS Duo) Memory Stick PRO (MS PRO) Memory Stick PRO Duo (MS PRO Duo) Memory Stick PRO-HG Duo MagicGate Memory Stick (MG) MagicGate Memory Stick Duo Note: These additional media types are supported with a card adapter. Memory Stick Micro (M2) miniSD miniSD High Capacity Micro SD Memory Card (MicroSD) Micro SD High Capacity Memory Card (MicroSDHC)
Operating Environmental (all conditions non-condensing)	10°C 10% R.H. = 24 hours 10°C 90% R.H. = 24 hours 20°C 90% R.H. = 24 hours 30°C 90% R.H. = 24 hours 40°C 90% R.H. = 24 hours 50°C 90% R.H. = 24 hours 50°C 10% R.H. = 24 hours Extremes: 140°F (60°C) @ 80% R.H. for 96 hours -22°F (-30°C) @ 20% R.H. for 48 hours No power applied Delta °C < 1.0°C/min Delta % R.H. < 1.5% R.H./min Note: Test Parameters/Conditions - Power applied, unit operating on system ±5%
Operating Systems Supported	Windows 8 Pro (64-bit)* Windows 8 (64-bit)* Windows 7 Ultimate (32-bit)** Windows 7 Ultimate (64-bit)** Windows 7 Professional (32-bit)** Windows 7 Professional (64-bit)** Windows 7 Home Basic** Windows 7 Home Premium (32-bit)** Windows 7 Home Premium (64-bit)** Windows Vista Business 64 Windows Vista Business 32 Windows Vista Home Basic 32 Windows XP Professional Windows XP Home 32 No driver is required for this device. Native support is provided by the

		operating system. Note: Not all features are available in all editions of Windows 8. Systems may require upgraded and/orseparately purchased hardware, drivers and/or software to take full advantage of Windows 8functionality. See http://www.microsoft.com. Note: Not all features are available in all editions of Windows 7. This system may require upgraded and/orseparately purchased hardware to take full advantage of Windows 7 functionality. See http://www.microsoft.com/windows/windows-7/ for details.
	Kit Contents	Media card reader, 5.25" bracket/rails/bezel, Install Guide, IO & Security Software and Documentation CD
	Approvals	USB-IF, WHQL, Compliant with USB Mass Storage Class Bulk only
HP CMT Handle in Top Optical Bay	**Features**	• Front panel handle/grip for Z4 and Z2 when loaded in top 5.25" external bay • Two tool-free 2.5" SFF drive carriers (drives not included)
	Dimensions (HxWxD)	42.7 x 149.0 x 205.5 mm
	Weight	0.6 kg (1.3 lbs)
	Operating Temperature	5° to 35°C (40° to 94°F)

Technical Specifications - Controller Cards

HP IEEE 1394b FireWire PCIe Card	**Data Transfer Rate**	Supports up to 800 Mbps
	Devices Supported	IEEE-1394 compliant devices
	Bus Type	PCIe card full height PCIe slots
	Ports	Two IEEE-1394b bilingual 9-Pin Connector (Rear)
	Internal Connectors	One 10-Pin header Custom Connector
	System Requirements	Windows 7 Professional 32-bit and 64-bit, Microsoft® Windows® XP Professional, Windows XP Home, Windows Vista, SLED 11 and RHEL 6. Intel Pentium® G series or higher processor, 128-MB RAM, 1-GB Hard Drive, CD-ROM drive, built in sound system, Available PCIe slot.
	Temperature – Operating	50° to 131° F (10° to 55° C)
	Temperature – Storage	–22° to 140° F (–30° to 60° C)
	Relative Humidity – Operating	20% to 80%
	Compliances	FCC Part 15B, cULus 60950, CE Mark EN55022B(1995)/EN55024-1998 STD, Taiwan BSMI CNS13438, Korea MIC
	Operating Systems Supported	Windows 7 Professional 32-bit and 64-bit, Windows Vista® Business 32-bit and 64-bit, Windows® XP Professional, XP Professional 64-bit. Not supported on Linux.
HP Thunderbolt-2 PCIe 1-port I/O Card	**Data Transfer Rate**	Supports up to 20 Gb/s (20,000 Mb/s)
	Devices Supported	Thunderbolt™ certified devices
	Bus Type	PCIe card, full or half height PCIe slots
	Ports	One Thunderbolt™ 2 external 20-Pin output connectors (Rear)
	Internal Connectors	One 5-Pin header connector
	System Requirements	Genuine Windows 7 Professional 64-bit, Genuine Windows 8.1 64-bit, Intel i5 series or higher processor, 128-MB RAM, 1-GB Hard Drive, available PCIe slot.
	Temperature - Operating	50° to 131° F (10° to 55° C)
	Temperature - Storage	-22° to 140° F (-30° to 60° C)
	Relative Humidity - Operating	20% to 80%
	Compliances	FCC Part 15B, cULus 60950, CE Mark EN55022B(1995)/EN55024-1998 STD, Taiwan BSMI CNS13438, Korea MIC
	Operating Systems Supported	Genuine Windows 7 Professional 64-bit, Genuine Windows 8.1 64-bit.
	Kit Contents	HP Thunderbolt™ 2 PCIe 1-port I/O Card, full height and half height bracket, DisplayPort to DisplayPort cable, internal header cables(2), user documentation and warranty card.
	Warranty	The HP Thunderbolt™ 2 PCIe 1-port I/O Card has a one-year Limited Warranty or the remainder of the warranty of the HP supported product in which it is installed. Technical support is available seven days a week, 24 hours a day, by phone, as well as online support forums. Certain restrictions and exclusions apply.

Technical Specifications - Networking and Communications

Integrated Intel 82579LM PCIe GbE Controller	**Connector**	RJ-45
	Controller	Intel 82579LM GbE platform LAN connect networking controller
	Memory	24 KB FIFO packet buffer memory
	Data Rates Supported	10/100/1000 Mbps
	Compliance	802.1P, 802.1Q, 802.2, 802.3, 802.3ab, 802.3az, 802.3u
	Bus Architecture	PCI Express and SMBus
	Data Transfer Mode	PCIe-based interface for active state operation (S0 state) and SMBus for host and management traffic (Sx low power state)
	Power Requirement	Requires 3.3V and 1.05V or just 3.3V with integrated regulators
	Boot ROM Support	Yes
	Network Transfer Mode	Full-duplex; Half-duplex (not supported for the 1000BASE-T transceiver)
	Network Transfer Rate	10BASE-T (half-duplex) 10 Mbps 10BASE-T (full-duplex) 20 Mbps 100BASE-TX (half-duplex) 100 Mbps 100BASE-TX (full-duplex) 200 Mbps 1000BASE-T (full-duplex) 2000 Mbps
	Management Capabilities	WOL, auto MDI crossover, PXE, Muti-port teaming, RSS, Advanced cable diagnostic. AMT 7.0 support

Intel Gigabit CT Desktop NIC	**Connector**	RJ-45
	Controller	Intel WG82574L Gigabit Ethernet Controller
	Memory	Integrated Dual 48K configurable transmit receive FIFO Buffers
	Data Rates Supported	10/100/1000 Mbps
	Compliance	IEEE 802.1P, 802,1Q, 802.2, 802.3, 802.3AB and 802.3u compliant, 802.3x flow control
	Bus Architecture	PCI-E 1.0a
	Data Path Width	X1, 250 MB/s, Bi-directional interface
	Data Transfer Mode	Bus-master DMA
	Hardware Certifications	FCC, B, CE, TUV- cTUVus Mark Canada and United States, TUV- GS Mark for European Union
	Power Requirement	Aux 3.3V, 3.0 Watts in 1000base-T and 2.0 Watts in 100Base-T
	Boot ROM Support	Yes
	Network Transfer Rate	10BASE-T (half-duplex) 10 Mbps 10BASE-T (full-duplex) 20 Mbps 100BASE-TX (half-duplex) 100 Mbps 100BASE-TX (full-duplex) 200 Mbps 1000BASE-T (full-duplex) 2000 Mbps
	Operating Temperature	32° to 131°F (0° to 55° C)
	Operating Humidity	85% at 131° F (55° C)
	Dimensions	12.1 x 5.7 x 2.0 cm (4.75 x 2.25 x 0.8 in)

Technical Specifications - Networking and Communications

	Operating System Driver Support	Windows 7 Professional 32-bit and 64-bit, Windows Vista Business 64, Windows Vista Business 32, Windows XP Professional, Windows XP x64. Red Hat Enterprise Linux 4 (RHEL4.8 or newer)*, Red Hat Enterprise Linux 5 (RHEL5.3 or newer), Red Hat Enterprise Linux 6, SUSE Linux Enterprise Desktop (SLED) 11 RHEL 4 and 5, SLED 10, are not supported on the Z220 CMT/SFF
	Management Capabilities	WOL , PXE, DMI, WFM 2.0
	Kit Contents	Intel Gigabit CT Desktop NIC, low profile bracket, CD containing Intel PROset II NIC drivers, quick install guide, product warranty statement
Broadcom (5761) NetXtreme Gigabit Ethernet Plus NIC	**Connector**	RJ-45
	Controller	Broadcom 5761 PCI-Express LAN Controller
	Memory	8 MB NVRAM serial Flash
	Data Rates Supported	10/100/1000 Mbps
	Compliance	IEEE 802.1P, 802.1Q, 802.2, 802.3, 802.3AB, 802.3u, and 802.3x
	Bus Architecture	PCI-Express
	Data Path Width	Single Channel PCI-Express
	Data Transfer Mode	Bus Master DMA
	Hardware Certifications	FCC class B, Canada and US NRTL Mark, C-Tick for Australia, BSMI for Taiwan, VCCI for Japan, MIC for Korea, GOST for Russia, UL listed (E212044), European Union Notice (CE 0682)
	Power Requirement	1.8W @ 3.3V
	Boot ROM Support	Yes
	Network Transfer Mode	Full-duplex Half-duplex (not available for the 1000BASE-T transceiver)
	Network Transfer Rate	10BASE-T (half-duplex) 10 Mbps 10BASE-T (full-duplex) 20 Mbps 100BASE-TX (half-duplex) 100 Mbps 100BASE-TX (full-duplex) 200 Mbps 1000BASE-T (full-duplex) 2000 Mbps
	Operating Temperature	32° to 131°F (0° to 55° C)
	Operating Humidity	131° F (55° C) with 5% to 95% non-condensing humidity
	Dimensions	7 cm x 10.5 cm (2.75 in x 4.13 in), low profile compatible
	Operating System Driver Support	Windows 7 Professional 32-bit and 64-bit, Windows Vista 32-bit SP1, Windows Vista x64 SP1, Windows XP 32 bit professional, Windows XP x64 Red Hat Enterprise Linux (RHEL) 5, 6; Novell SLED 10 & 11
	Management Capabilities	ACPI, WOL and DMI 2.0, PXE 2.0, WfM 2.0, Broadcom mgmt utility, ASF2.0, DASH 1.0 and DASH 1.1 profiles
	Kit Contents	Broadcom NetXtreme Gigabit Ethernet Plus NIC, Broadcom NetXtreme Gigabit Ethernet Plus NIC USB Cable Assembly, CD, drivers, quick install guide, product warranty statement

Technical Specifications - Networking and Communications

HP 361T PCIe Dual Port Gigabit NIC	**Connector**	Two RJ-45
	Controller	Intel® Ethernet I350 Controller
	Data Rates Supported	10/100/1000 Mbps, Half- and full-duplex
	Compliance	802.3, 802.3u, 802.3x, 802.3ab, 802.3ad, 802.1p, 802.1Q, 802.3az, IEEE 1588 PCIe v2.0 standard RoHS (6 of 6) FCC (U.S. only) Class B DOC (Canada) Class B CE EN 55024, EN55022 Class B VCCI Class II UL 1950 CSA 950 EN 60950 CE ACPI 1.1a Microsoft WHQL (Windows Hardware Quality Labs)
	Bus Architecture	PCI-E 1.0a
	Data Path Width	Four lane (x4) PCI Express compatible with x4, x8, and x16 PCI Express slots
	Power Requirement	4.1W idle without EEE link partner 3.2W idle with EEE link partner 4.2W maximum
	Network Transfer Rate	10BASE-T (half-duplex) 10 Mb/s 10BASE-T (full-duplex) 20 Mb/s 100BASE-TX (half-duplex) 100 Mb/s 100BASE-TX (full-duplex) 200 Mb/s 1000BASE-T (full-duplex) 2000 Mb/s
	Operating Temperature	32° to 131°F (0° to 55° C)
	Operating Humidity	10% to 95% non-condensing
	Dimensions (H x W x D)	5.3 x 2.5 in (13.50 cm x 6.4 cm) (without brackets)
	Operating System Driver Support	Windows 7 Professional 32-bit and 64-bit. Red Hat Enterprise Linux(RHEL) WS4, 5, 6 Desktop/Workstation Novell SLED 10 & SLED 11
	Management Capabilities	WOL , PXE 2.1
	Kit Contents	HP 361T PCIe Dual Port Gigabit NIC PCA with a standard height bracket attached to it (the low profile bracket is included in the clamshell that the PCA ships in) Product Warranty statement and the Quick Install Card (QIC).
HP X520 10GbE Dual Port Adapter	**Hardware Certifications**	FCC B, UL, CE, VCCI, BSMI, CTICK, KCC

Technical Specifications - Networking and Communications

HP 10GbE SFP+ SR Transceiver	**Operating Temperature**	0°C to 45°C (32°F to 113°F)
	Operating Humidity	0% to 85%, noncondensing
	Dimensions (H x W x D)	0.47(h) x 0.54(w) x 2.19(d)inches (1.19 x 1.38 x 5.57 cm)

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